GUST, 1947 TECHNOLOGY DEPARTMENT TWO SHILLINGS

Plastics

EALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

PUBLIC LIBRARY
AUG 24 1947
DETROIT

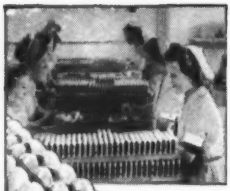
XYLONITE"
(Celluloid)
BEXOID"
(Cellulose Acetate)
BX P.V.C.
(Polyvinyl Chloride)
BX
POLYSTYRENE
LACTOID"
(Casein)
BX ETHYL
CELLULOSE
SOFLEX"
(Lightweight Thermal
Insulation)

BX Leaders in Thermo-Plastics

PLASTICS LTD · HIGHAM STATION AVENUE · LONDON · E.4
HEAD SALES OFFICE:
Telephone: LARkswood 4491
AREA SALES OFFICES:
Street Buildings, 1 Ridgefield, Manchester 2
Telephone: Manchester Blackfriars 0258.
42 Wellington Street, Sheffield.
Telephone: Sheffield 25517
48, Moor Street, Birmingham, 4.
Telephone: Midland 0132
WORKS: LONDON, MANNINGTREE, DUNDEE

TRANSFER

attention value to your product



The brilliant colours of paint, many times brighter than printers' ink, allied to unrestricted design in bold relief, can extract for your product the maximum attention value.

Among many well-known and well-advertised "names" the manufacturers of the Vick Inhaler make use of Trapinex (Regd.) Transfers by the million for their plastic container.

The Vick Inhaler is also featured on shop windows by Trapinex Paint Transfers in brilliant relief colours, thus making the final vital link between Press advertising and the product at the point of sale in a manner which compels attention and ensures maximum sales.

—with production-line speed for packaging

and brilliant colour for point of sale publicity

Trapinex offers all the advantages that paint has over printers' ink—more brilliant colours in any number, unfettered design, greater durability, washability and weather-resisting qualities.

Advice freely given, but when you write for prices please state: (1) Size, (2) Quantity, (3) Number of colours, (4) Purpose, (5) Wording required, (6) A rough sketch would help. WE HAVE NO STOCK LINES OR PRICE LISTS.

TRAPINEX *Paint* **PROCESSES**

Trapinex (Regd.) Paint Transfers are fully patented and manufactured only by:

TRAPINEX LTD., High Road (opposite Town Hall), Wood Green, N.22

'Phone: Bowes Park 6911/3. 'Grams: "Trapinex Wood, London." Cables: Trapinex, London

YOU CAN'T STOP A MAN WITH A GOOD IDEA

"Came at me like a cannon ball — the idea that it can be made in rubber. Must speak to Lorival about it!"

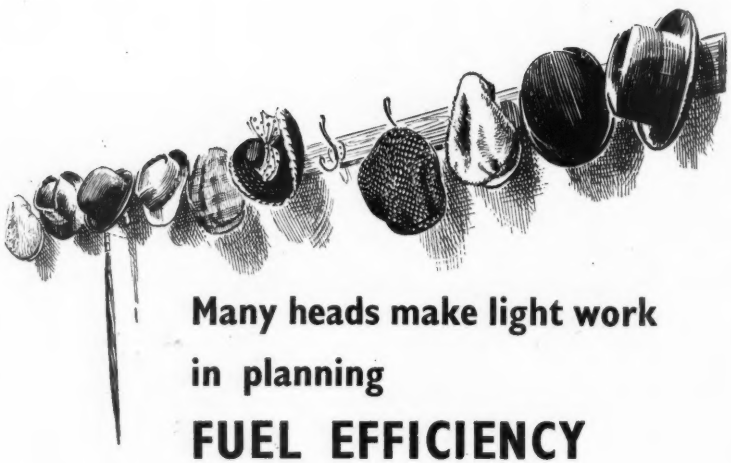
RUBBER OR PLASTICS?

★ *While each material possesses its own characteristics, in many applications one is as suitable as the other, and in these times of scarcity it is as well to have this in mind. Firms in need of components, complete articles or packaging should seek our advice, which is based upon wide experience and specialized knowledge. We produce articles in rubber and ebonite as well as plastics, and our service includes design and manufacture.*

LORIVAL PLASTICS

UNITED EBONITE & LORIVAL LIMITED

LITTLE LEVER, NEAR BOLTON, LANCS



Many heads make light work in planning FUEL EFFICIENCY

Joint Production Committees are doing grand work in maintaining output

How can you keep up production in the face of the fuel cuts? Joint consultation of management and workers is providing a most valuable source of ways and means. See that the Joint Production Committee gets the fuel facts—*and passes them on* to the rest of the workers so that all can play their part in solving your fuel difficulties.

Get the co-operation of your workers to make sure that the Joint Production Committee represents *all sections* in the works. The missing group may have the man with the bright fuel efficiency ideas. Specialists are ready to help and advise you and the Joint Production Committee. The first step is to get into touch with your Regional Fuel Office: you will find the address below.

HOW THE FUEL EEFICIENCY SERVICES CAN HELP TO HEAL YOUR FUEL CUT

Here are other Fuel Efficiency Services at your disposal:

1. *Visits and recommendations by specialist engineers.*
2. *Training of boiler house personnel at your factory.*
3. *Instructional classes, for boiler house personnel.*
4. *Evening classes, lectures and films, for executives, boiler attendants and maintenance staff.*
5. *Fuel efficiency films, slides and film-strips.*
6. *Publications (e.g. Fuel Efficiency News special bulletins, leaflets, posters, etc.)*

YOUR REGIONAL FUEL OFFICE

REGION	ADDRESS	TELEPHONE
Northern	Government Buildings, Ponteland Road, Newcastle-on-Tyne, 5	Newcastle 28131
North-Eastern	71, Albion Street, Leeds, 1	Leeds 23616
North-Midland	Castle Gate House, Castle Gate, Nottingham	Nottingham 46216
Eastern	Shaftesbury Road, Brooklands Avenue, Cambridge	Cambridge 56268
London	Mill House, 87/89, Shaftesbury Avenue, W.1	Gerrard 9700
South-Eastern	Oakfield Court, Grove Hill Road, Tunbridge Wells	Chatham 3233
Southern	Whiteknights, Earley, Reading	Reading 61491
Wales	27, Newport Road, Cardiff	Cardiff 9234
South-Western	12/14 Apsley Road, Clifton, Bristol, 8	Bristol 38223
Midland	Temporary Office Buildings, Hagley Road West, Birmingham, 17	Bearwood 3071
North-Western	Burton Road, West Didsbury, Manchester, 20	Didsbury 5180-4
Scotland	145, St. Vincent Street, Glasgow, C.2	Glasgow City 7636

ISSUED BY THE MINISTRY OF FUEL AND POWER

FEROBESTOS

Technical Plastics

DIMENSIONAL STABILITY

The asbestos base in FEROBESTOS when used in conjunction with our special resins is non-absorbent so that dimensional changes, due to moisture absorption, are practically non-existent.

We normally undertake the production of finished components which can be machined to fine limits. Tolerances as low as plus and minus ·01″ are frequent and in special cases can be brought as low as plus and minus ·0005″.

Physical & Mechanical Properties of FEROBESTOS

Grade	EP	LA	LF
Base	Asbestos Non-woven	Asbestos Cloth Heavy Weave	Asbestos Cloth Fine Weave
Tensile Strength (lb./sq. in.)	27,000	7,000	12,000
Compressive Strength (lb./sq. in.)	65,000	34,000	42,000
Shear Strength (lb./sq. in.)	18,000	11,000	15,000
Cross-breaking St'gth (lb./sq. in.)	29,000	14,000	19,000
Impact Strength (ft./lb.)	5	2.5	4
Fatigue Strength (tons/sq. in.)	3.75	1.0	2.25
Density (Gm./c.c.)	1.87	1.87	1.74

FEROBESTOS

TECHNICAL PLASTICS

Made by

REG'D TRADE MARK FERODO

FERODO LIMITED · CHAPEL-EN-LE-FRITH

This hair dryer hood for Salon (Nelson) Ltd. is a good example of "Fitness for purpose"—the "Perspex"† material is light in weight and an electrical insulator, while its lustrous colour and smooth modern appearance enhances its surroundings. The fabrication of the hood needed—and exemplifies—the technical skill of our craftsmen.

We also make mouldings, in the material most satisfactory for the job, and "ASHLAM"* Electrical Insulating Boards.

*"ASHLAM" is the registered trade mark of Ashdowns Ltd. †"PERSPEX" is the registered trade mark of I.C.I. Ltd.

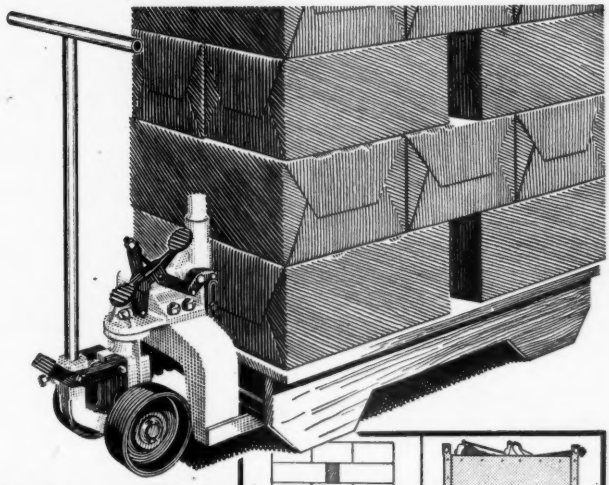
If you've a problem that plastics may solve—

ask Ashdowns

Ashdowns is a subsidiary of Pilkington Brothers Limited

ASHDOWNS LIMITED, ECCLESTON WORKS, ST. HELENS, LANCS. *Telephone:* ST. HELENS 3206

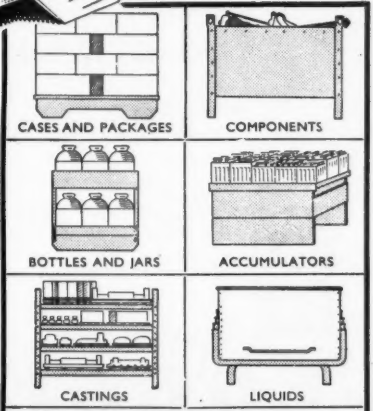
. . . it makes the floor move



With the Collis Truck one man does the work of a whole gang, because, in effect —it makes the floor move! Its use eliminates loading and unloading as separate operations. It makes use of the handling that is inseparable from previous or succeeding work. Goods are placed on a platform, instead of on the floor. The Collis Truck loads the platform, transports it easily and safely, and unloads it where required—*it makes the floor move!* There is a Collis Truck to handle every type of load up to 7½ tons. Special models designed to order.

write for illustrated catalogue

giving full particulars and, if desired, ask our Area Representative to call. J COLLIS & SONS LTD 45F REGENT SQUARE GRAYS INN ROAD LONDON WC1 : Phone TERm'nus 6141



COLLIS PLATFORMS are made to carry every type of load. A few representative models are shown above.

The Collis Truck

® T.6

for second-hand machinery
FOR THE PLASTICS INDUSTRY

also Electric Motors, Oil Engines
Pumps, Compressors, Fans, Blowers
Boilers, Tanks & Works Equipment

Send your enquiries to the largest Stockholders

ONE OF THE 600 GROUP OF COMPANIES

GEORGE COHEN
SONS & COMPANY LIMITED

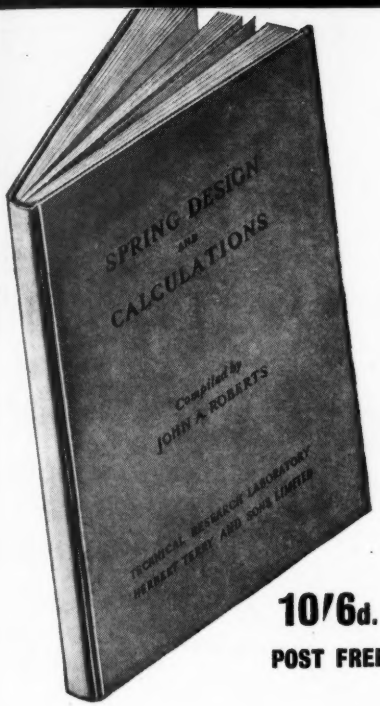
WOOD LANE, LONDON, W.12 • Telephone: Shepherds Bush 2070 . Telegrams: Omniplant, Chisk, London
and STANNINGLEY, NEAR LEEDS • Telephone: Pudsey 2241 • Telegrams: Coborn, Leeds

ALSO AT BIRMINGHAM, NEWCASTLE-ON-TYNE, SHEFFIELD, MANCHESTER, GLASGOW.
SWANSEA, SOUTHAMPTON, BELFAST, BATH, ETC · ESTABLISHED 1834

471/P117

WORKS AND PRODUCTION ENGINEERS, MECHANICAL RESEARCH SPECIALISTS

should possess this book!



10/6d.

POST FREE

List of contents

Foreword

1 *Helical Compression and Extension Springs*
2 *Extension Springs and Initial Tension*
3 *Calculation of Helical Compression and Extension Springs*
4 *Square and Rectangular Section Springs*
5 *Volute Springs*
6 *Conical Springs*
7 *Valve Springs*
8 *Surging of Valve Springs*
9 *Natural Frequency*
10 *Natural Frequency of a Single Mass System*
11 *Springs with Material Subject to Bending Stresses. (Helical and Spiral Torsion Springs)*
12 *Power of Clock Type Springs*
13 *Flat Springs*
14 *Multiple Leaf Springs or Laminated Springs*
15 *Belleville Washers*
16 *Circlips or Retaining Rings*
17 *Combined Axial and Horizontal Loading on Compression Springs*
18 *Spring Driving Belts*
Tables
Helpful Hints when Ordering Springs

Terry's, the recognized leaders of the British Spring Industry, have produced the most authoritative text book on springs yet published. It answers a wide variety of practical spring problems drawn from Terry's ninety years' experience in this specialized field. Every executive engineer should have a copy of this valuable book of reference. Fill in the coupon for your copy and post today.

HERBERT TERRY & SONS LTD. (DEPT. U) REDDITCH ENGLAND

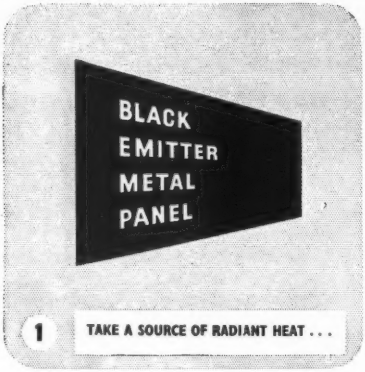
POST TODAY TO HERBERT TERRY & SONS LTD (DEPT U) REDDITCH ENGLAND

Please send me a copy of "Spring Design and Calculations." I enclose 10/6.

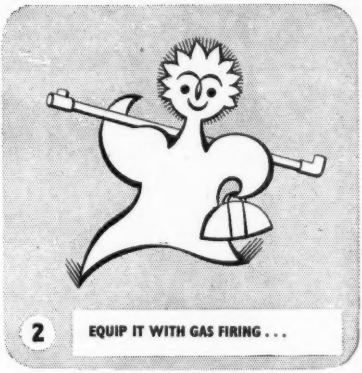
NAME_____

NAME & ADDRESS OF FIRM_____

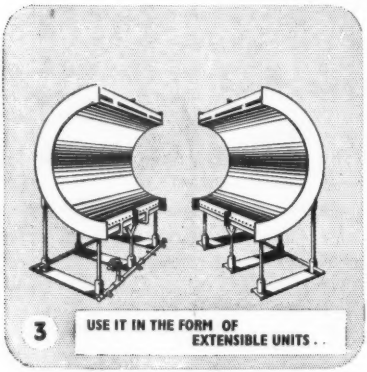
QUICK DRYING BY INFRA-RED



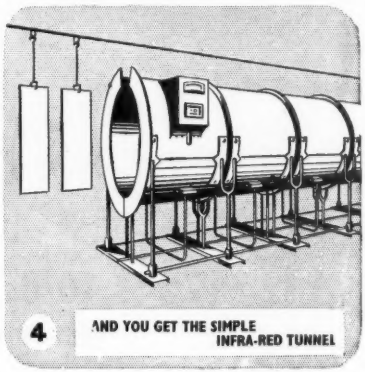
1 TAKE A SOURCE OF RADIANT HEAT . . .



2 EQUIP IT WITH GAS FIRING . . .



3 USE IT IN THE FORM OF EXTENSIBLE UNITS . .



4 AND YOU GET THE SIMPLE INFRA-RED TUNNEL

The gas-fired infra-red drying tunnel is robust, compact, inexpensive . . . easily constructed in different shapes and sizes without complicated auxiliary apparatus . . . giving even distribution of radiation and wide range of flux density at the turn of a tap . . . no material difference in drying time due to colour . . . low capital and fuel costs. Technical literature free on request.

FOR SIMPLICITY AND CONTROL THE CHOICE WILL BE

GAS

BRITISH GAS COUNCIL · 1 GROSVENOR PLACE, LONDON, SW1

the long view . . .

Our ideas and plans are one jump ahead of present-day trends . . . we have to be prophetic about future Plastic possibilities and so be ready for your problems. A long view indeed . . . but one that gives you the benefit of the most modern plastic developments.

U·K PLASTICS

Fabricating, Engraving and Moulding of Plastics,
Printing on Plastics, Aluminium, Glass, Wood, etc

U.K. PLASTICS LTD., KINGSTON BY-PASS, SURBITON, SURREY

Telephone: Elmbridge 2814-5 Established 1911 Telegrams: Celluprint, Surbiton

R P.1185B.

B

COMPLETE PLANTS

for

- Transparent Wrappings
- Film Casting
- Paper & Fabric Coating
- Solvent Recovery

FRENKEL'S MACHINES
(GT. BRITAIN) LIMITED.

329 HIGH HOLBORN, LONDON, W.C.1

TELEPHONE: HOLBORN 3842/9747

Pioneers of History

CHRISTOPHER COLUMBUS. Made the first journey to America in 1492, thus opening the gateway to the Western Hemisphere. Truly a pioneer of History!

We too, can claim to be pioneers in Plastic Moulding and place at your disposal a vast amount of knowledge gained in the hard school of experiment and experience.

Bring your moulding problems to us. All enquiries treated in the strictest of confidence.

ROBERT McARD & CO. LTD.

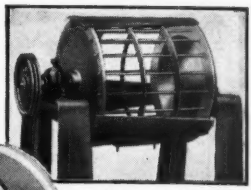
CROWN WORKS • DENTON • MANCHESTER

Pioneers IN MOULDED PLASTICS

Rings of Linatex Rubber UNDER COMPRESSION

form the drum of this remarkable new Ball Mill

This fine new Wilkinson product gives Engineers a Ball Mill of adequate strength and exceptional abrasive resistance. Instead of a metal drum lined with porcelain or rubber, the barrel of this new Ball Mill consists entirely of rings of Linatex Rubber compressed together (the ideal condition for maximum durability and abrasive resistance) and held immovably in place by tie rods embedded in the rubber itself. Metallic contamination of contents is impossible, and the whole Ball Mill combines lightness with robust structural design. Note the special quick-release hand hole.



UNITS COMPLETE with motor and reduction gear, or for line shaft drive. Replacement drums supplied for existing units. Sizes 1' 0" dia. to 3' 0" dia. Speeds: to suit customers requirements.

Write for illustrated leaflet.

Highly recommended for use in such industries as:-
CERAMICS. PIGMENTS. PLASTICS etc.. etc.

OLD METHOD
Consists in bonding, or fixing mechanically, a rubber lining to the internal surfaces of the drum.

NEW METHOD
The new Wilkinson development is a scientific combination of rubber and metal.

The new *Patent No. 576419*

LINATEX RUBBER BALL MILL

*WILKINSON RUBBER LINATEX LTD.,
FRIMLEY ROAD, CAMBERLEY, SURREY
Tel.: Camberley 1595
Also in Canada, Australia, South Africa, U.S.A., India, Malaya

WILKINSON PRODUCT

★ *Also makers of Flexatex Hose, Linatex, Novatex, and the Linatex Pump.*

Tullis Russell & Co. Ltd.

Makers of

BASE PAPERS

for the

PLASTICS INDUSTRY

•

AUCHMUTY & ROTHES PAPER MILLS

MARKINCH, SCOTLAND

LONDON
1 Tudor Street, E.C.4

MANCHESTER
372 Corn Exchange Buildings
Corporation Street

BIRMINGHAM
116 Colmore Row

Reg'd. Trade Mark

BRITISH INDUSTRIES FAIR

BIF

LONDON AND BIRMINGHAM

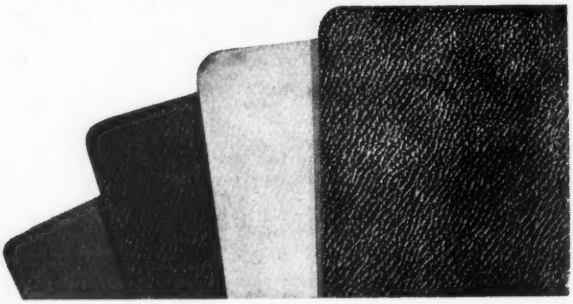
3-14th MAY 1948

Applications for space should be made not later than 20th September, 1947.

INTENDING EXHIBITORS who have not received an Application Form should write to the following address :

Board of Trade, Export Promotion Dept., 35, Old Queen St., London, S.W.1

DURAPLEX P.V.C. LEATHERCLOTH



Duraplex Leathercloth is 'scuff' proof, hard wearing and resistant to sea-water, oils, alkalis and most acids. Duraplex is impervious to oxidisation and it is also resistant to prolonged exposure to the weather. Duraplex cannot be soiled by oil or grease and stains are easily removed by warm soapy water. Duraplex is resistant against corrosive atmosphere and heat resistance is sufficiently adequate for all practical purposes. Duraplex abrasive resistance and flex life is superior to leather. Produced in a wide range of colours, going to the full depth of the material.

DURAPLEX P.V.C. SHEETING

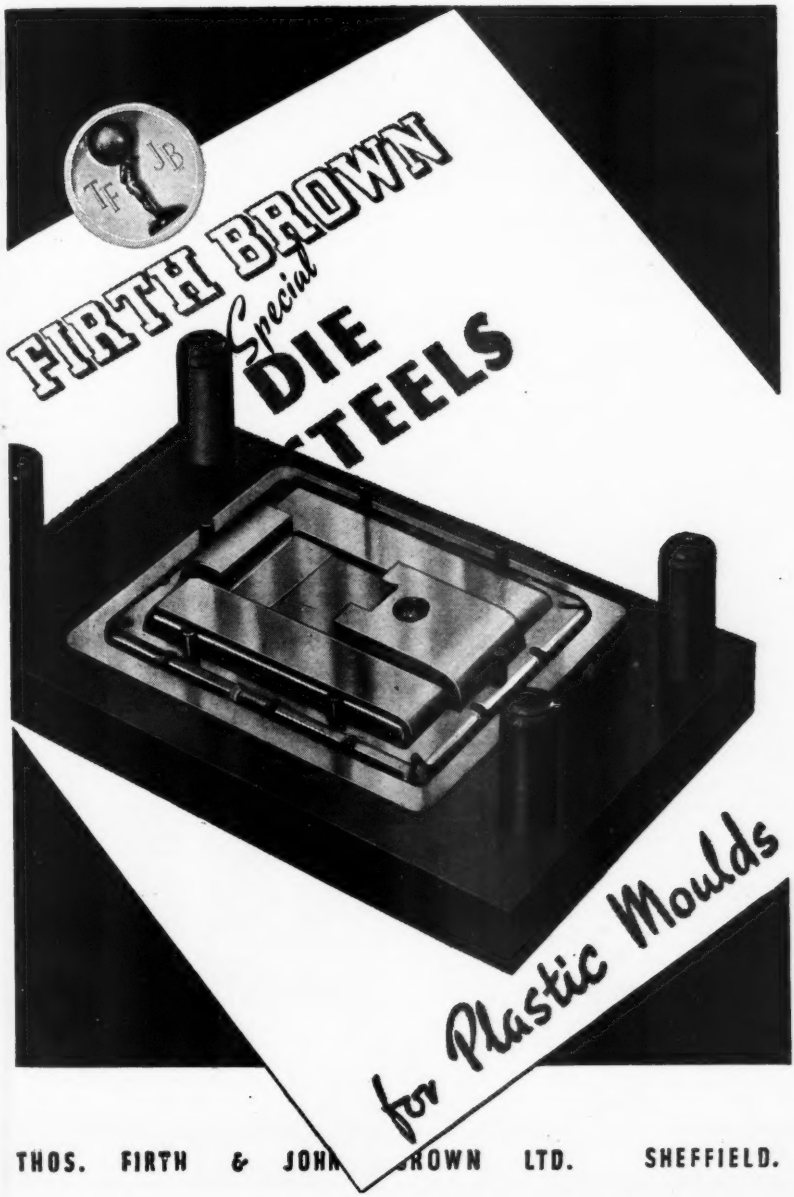
Manufactured in thicknesses between 6-8 thou" in Translucent and Opaque. Unlimited colour range.

With its wide range of colours makes it ideal for printing in attractive colours and designs. Duraplex sheeting has a beautiful smooth texture and drapes gracefully in all lengths. *Immediate Delivery.*

DURAPLEX (PLASTICS) LTD.

Burwood House, Caxton Street, London, S.W.1.

Telephone: WHitehall 2980 & 2989 *Grams:* POLYVYN, SOWEST, LONDON



THOS. FIRTH & JOHN BROWN LTD. SHEFFIELD.

If you **NEED**

HYDRAULIC PRESSES

we have

4,000-ton BALDWIN-SOUTHWARK six daylight HYDRAULIC MOULDING PRESS, steam platens 12' x 2' 6", with self-contained Pumping Equipment, Loading Gear, etc.

3,600-ton BECKER & VAL HUELLEN six daylight MOULDING PRESS, platens 10' 6" x 2' 7½", with self-contained Pumping Equipment and Loading and Unloading Gear.

1,880-ton DOWNSTROKE HYDRAULIC FORGING AND DRAWING PRESS by Henry Berry, table 6' square, with Air Hydraulic Accumulator and Motor Driven Three Throw Pump.

1,500-ton FIELDING & PLATT DOWNSTROKE DIE FORGING PRESS, table 5' square, with self-contained Pumping Equipment.

1,000-ton DOWNSTROKE HYDRAULIC PRESS by Rice & Co. Ltd., table 6' x 4', 23" ram, 6' daylight, with Ejectors and Intensifier and Accumulator and Three Throw Hydraulic Pump.

Two 900-ton John Shaw LEAD EXTRUSION PRESSES, self-contained, with Pump.

780-ton HYDRAULIC PRESS, table 6' x 4', 4' daylight, 20" ram.

500-ton HYDRAULIC COTTON BALING PRESS, table 6' x 4', 6' 6" daylight, 18" ram.

400-ton DOWNSTROKE HYDRAULIC PRESS by John Shaw, ram 23" dia., table 4' 6" x 4', 3' 8" daylight.

Three 300-ton UPSTROKE HYDRAULIC PRESSES by John Shaw, table 2' 9" square, daylight 4'.

250-ton HYDRAULIC PRESS, table 6' x 3' 6", daylight 3' 6".

Several Smaller Hydraulic Presses, also Hydraulic Pumps, Accumulators, Intensifiers, Control Gear, etc.

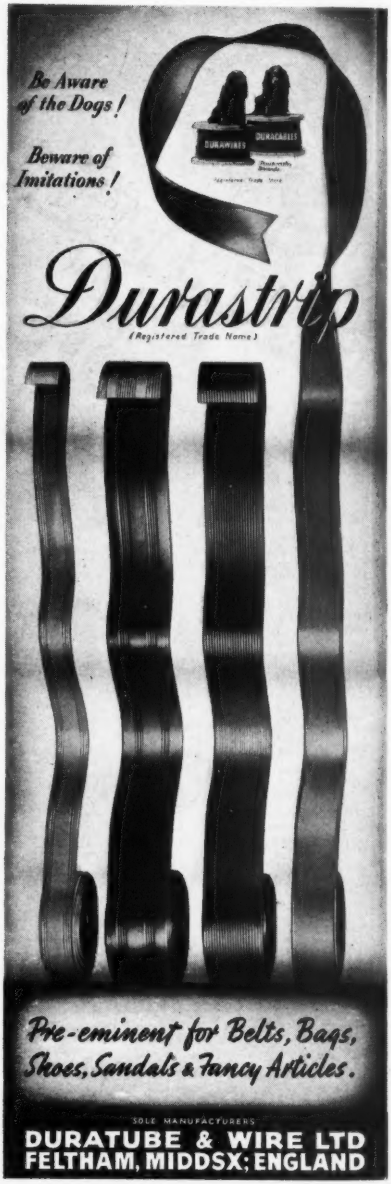
Send your enquiries to the people who specialise in Hydraulic Plant.

Ask

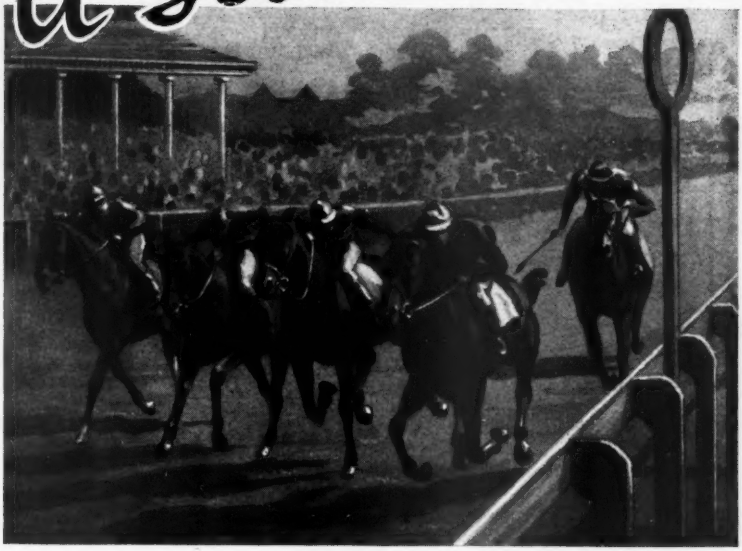
REED BROTHERS (ENGINEERING) LTD

Telephone:
AVE. 1677/8

BEVIS MARKS HOUSE, LONDON, E.C.3



A Good Finish



"QUALITY IS THE COURSE ON WHICH WE HAVE STAKED OUR FUTURE"

The practice of Derwent Plastics has always been to produce a good finished moulding and progress of the Derwent Organisation is built on the quality of its product. We give special attention to finishing and our supervision is of the highest order to maintain the quality for which we are well known.

DERWENT PLASTICS LIMITED
STAMFORD BRIDGE YORK TEL 54 STAMFORD BRIDGE
MINSTER MOULDINGS

C

William Gee Ltd

Finest Quality
Plastic (P.V.C.)
Sheeting

.007 to .008 Transparent
Tinted, Opaque and Printed.
DELIVERIES SAME DAY
FROM STOCK.

520, KINGSLAND ROAD . . . . . LONDON, E.8
Established 1906 Telephone: Clissold 1972, 3 lines

R.F. heating of plastics

A new addition to the RADYNE range of radio heaters, now available to industry

MODEL H40/A
Heating Capacity fully plasticise 3 lbs. per minute.
Oven Capacity 20 lbs.

MADE BY
radio heaters
WOKINGHAM · BERKS.
Tel.: WOKINGHAM 708

The Greatest advance ever made in PLASTICS-PRESS DESIGN!

* Independent THERMOSTATIC CONTROL for each hotplate, with thermometers to indicate temperatures.
* RE-SETTING MECHANISM for bottom ejectors, can be operated without moving the ram.
* MECHANICALLY INTERLOCKED SAFETY GUARDS.
* BUILT-IN INTERVAL TIMER to ensure accurate and uniform timing.
* ELECTRICAL SWITCHGEAR & CONTROLS totally enclosed for safety.
* ONE LEVER controls both opening and closing movements of the press.
* Totally enclosed HYDRAULIC SYSTEM prevents ingress of moulding flash, dust, etc.

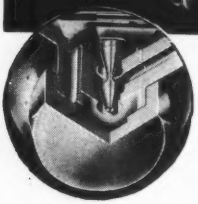
No other Press has all these advantages!

The Turner Plastics Press is completely self-contained. It provides any required pressure between 10 and 50 tons, and is installed by making a single connection to the electrical supply. Fully descriptive literature gladly sent on request.

The TURNER PLASTICS PRESS

TURNER MANUFACTURING CO. LTD., WULFRUNA WORKS, VILLIERS STREET, WOLVERHAMPTON

The amazing MIL *steam trap*



gives you these positive advantages

SAVES FUEL · GIVES HIGHEST EFFICIENCY · INCREASES PERFORMANCE ELIMINATES TROUBLE · REDUCES COSTS. Hundreds of steam users, from jam manufacturers, canners, laundries to hospitals have proved over the last twelve months by exhaustive tests that the MIL Steam Trap is suitable for practically every job throughout a steam system. Tests have shown that because of the unique construction of MIL Traps stoppages are practically non-existent and apparatus works far more efficiently. In these days of fuel shortages it is essential that every pound of steam be used to the utmost. We believe that in the MIL Steam Trap we have the answer and invite manufacturers to write for full technical data.

PIN THIS COUPON TO YOUR NOTE-HEADING & MAIL TO-DAY

TYPES OF EQUIPMENT USED.....

.....

119

MIDLAND INDUSTRIES LTD., STEAM TRAP DIV., WOLVERHAMPTON **TEL. 23901**

MI/S S.P.O.'C

MOULDED PRODUCTS LTD

Pioneers in the Plastic Field, there is no class of moulding which Moulded Products Ltd. cannot undertake and after years of practical experience an organisation of designers, research workers and skilled technicians has been established which is superbly equipped to meet the specialised needs of manufacturers who require plastic parts or accessories of the highest quality finish within precision limits at economically competitive prices.

Send us your enquiries

A Technical Representative is available to discuss moulding problems at your own premises, if desired.

MOULDED PRODUCTS LTD.,

CHESTER ROAD, TYBURN, BIRMINGHAM

DIEHARD

Pah Tools? YUS—I've heard of pah tools. I've *seen* pah tools. 'lectric ones! Pewmatic ones. Fiddlin' things like what you'd give your kid to play wiv. You don't get me usin' no pah tools. I must of screwed a 'undred million screws in by 'and and I ain't startin' no pewmatic doodahs. Pah tools are faster? Oo *wants* to be faster? Easier? Work wasn't meant to be easy, mate. Work 'as to be 'orrible or we shouldn't want to stop! You bin readin' them Desoutter ads mate, that's wot you bin doin'. You don't want to be led away by no adver*tise*ments. Stick to your screw-driver, mate, and go 'ome tired of an evening, same as me. ***Desoutter! Pah!***

Specialists in Lightweight, Pneumatic and Electric Portable Tools.

DESOUTTER BROS. LTD. (DEPT. S) THE HYDE, HENDON, LONDON, N.W.9. TELEPHONE: COLINDALE 6346-7-8-9.

C.E.C.166

The Schori Roving Reporter writes :

Flame sprayed Plastics

GIVE A TOUGH, DECORATIVE FINISH TO ANY SURFACE

Plastics such as Polythene, Thiokol, some of the Vinyl resins, also Shellac, Ebonite and Sulphur, are being sprayed with astonishing success by the Schori flame pistol. They can be applied to any surface with the speed and ease of paint spraying. Applied without solvents, they give hard, brilliant, crack proof coverings of considerable thickness which need no stoving.

Suitably pigmented, Schori sprayed plastic finishes are as decorative as they are practical and protective. Architects, builders, manufacturers, shipbuilders, structural steel makers, etc., are finding them the modern answer to their finishing problems.

Schori sprayed Polythene gives a tough, non-chipping finish to steel furniture.

Licensees throughout the Country.

Schori METALLISING PROCESS Ltd

SCHORI METALLISING PROCESS LTD., BRENT CRESCENT, NORTH CIRCULAR RD., LONDON, N.W.10. Phone: ELGAR 7393

FORMALDEHYDE CH_2O

FOR THE PLASTICS INDUSTRY

B.N.R. Formaldehyde has gained a reputation among makers of plastics for its unvarying high quality and purity, maintained by constant laboratory control at every stage of production.

Prompt delivery in bulk or specially lined containers is provided.

SOLE SELLING AGENTS FOR B.N.R. FORMALDEHYDE:—

VICTOR BLAGDEN & CO., LIMITED

FRIARS HOUSE, NEW BROAD STREET, LONDON, E.C.2. LONDON WALL 5231

SPECIAL NICKEL CHROME STEEL FOR MOULDS

This quality is now offered for the first time as a free-cutting type without, however, impairing its well-known physical properties. Supplied in the ready heat-treated state for short runs, or in the annealed state for subsequent hardening, tempering and plating for long runs. After machining a high degree of polish is attained.

OUR OTHER SPECIAL MOULD STEELS ARE

K.E.A28. *For long runs, when using corrosive powders. This is a special stainless mould steel.*

K.E.961. *For long runs, having special resistance to abrasion. Expressly designed for the most accurate mould work. Possesses deep hardening qualities in oil or air with minimum distortion. Will not shrink in use and takes a hard mirror polish, which will not easily tarnish.*

K.E.169. *Presents a particularly hard surface after case-hardening. Polishes well and has a high core strength.*

K.E.970. *Particularly dense alloy steel for Master Hobs, etc.*

We specialise in the manufacture of all types of Precision Ground Steels to the finest limits to meet the needs of modern automatic production.

KAYSER ELLISON & CO. LTD.

CARLISLE STEEL WORKS, SHEFFIELD. EST. IN 1825

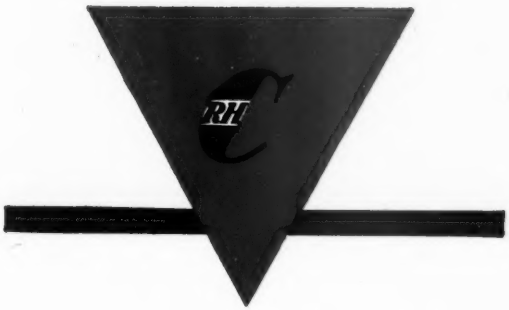
London Stockists (except for Stainless Steels): FARMER, STEDALL & CO., 145-157, St. John St., Clerkenwell, E.C.1

London Stockists for Stainless Steel : MACREADY'S METAL CO., LTD., 131-135, Pentonville Road, London, N.1

Makers of Synthetic
RESIN PAPERS
(IMPREGNATED AND COATED)
for the MANUFACTURE of LAMINATED SHEETS and TUBES
CAMBERWELL BEAUTY
Regd Trade Mark
SAMUEL JONES & CO. LTD
16-17 NEW BRIDGE STREET. E.C.4. PHONE: CENTRAL 6500

POLISHING PLATES
FOR THE PRODUCTION OF
PLASTIC SHEETING
SMOOTH MATT OR MIRROR FINISHES
UP TO 30 INCH WIDTH
HEELEY SILVER ROLLING MILLS LTD.
WORKS · GUERNSEY ROAD, SHEFFIELD
TELEPHONE 51081 TELEGRAMS: IXION SHEFFIELD

PPI



Polystyrene Moulding Granules

manufactured at Sarnia, Ontario
by

DOW CHEMICAL OF CANADA LTD.

Agents in Great Britain

R. H. COLE & COMPANY LIMITED

STYRON

(Registered Trade Name)

available in a wide range of colours in addition to crystal

Immediate delivery from stock in London

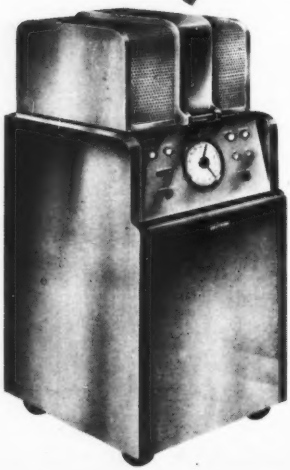
R. H. COLE AND COMPANY LIMITED
2, CAXTON STREET, WESTMINSTER, S.W.1
Phone: Whitehall 0711/2/3 **Grams: Geratole, Phone, London**

D

R.F. HEATING

Study these features—

1 Heating chamber has been designed to meet requirements of moulders. Free access to electrodes simplifies loading and unloading. Automatic lid opening.



2 Simplicity of operation. Operator has only one button to work.

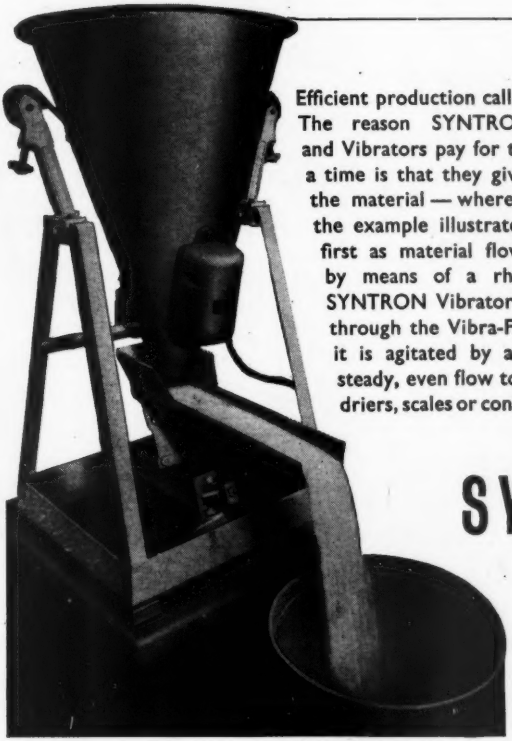
3 Heats 2 lb. of powder per minute to moulding temperature.

4 Electrodes can be adjusted during heating operation.

Demonstrations arranged, and early delivery given.

DELAPENA & SON LTD.
ZONA WORKS :: CHELTENHAM
Telephone: 53866/7/8

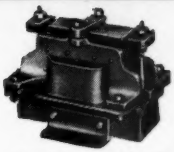
Complete control from first to last . . .



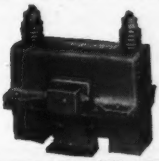
Efficient production calls for dependable feed. The reason SYNTRON Electric Feeders and Vibrators pay for themselves in so short a time is that they give *complete* control of the material — wherever it is needed. In the example illustrated, control is applied first as material flows from the hopper, by means of a rheostatically-controlled SYNTRON Vibrator, and also as it passes through the Vibra-Flow Conveyor, where it is agitated by a second vibrator. A steady, even flow to the mixers, grinders, driers, scales or containers is thus ensured.

SYNTRON ELECTRIC FEEDERS & VIBRATORS

'Noiseless' Model V15



Heavy Duty Model V55



Heavy Duty Models V75 and V125

The technical staff of International Combustion Ltd. are always ready to bring their exceptional experience to any material handling problem.

INTERNATIONAL COMBUSTION LTD

C29 NINETEEN WOBURN PLACE · LONDON · W.C.1 · WORKS: DERBY

Point ONE

IN CONSIDERING PLASTICS

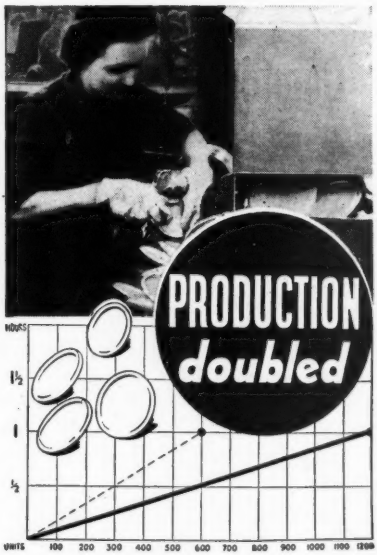
Will Plastics do the job? That's the first thing you want to know. Crystalate can tell you and will suggest the Plastic best suited for it at the lowest cost commensurate with the specification, the quality, and the volume of production required.

You require expert co-operation in the initial designing of the piece, and the help given at this vital preliminary stage has won for Crystalate an enviable reputation among the industries which Plastic mouldings serve.

CRYSTALATE

PLASTIC MOULDERS & TOOLMAKERS SINCE 1899

Crystalate Ltd., Golden Green, Tonbridge, Kent. Phone: Hadlow 233/4/5 (20 lines)



THANKS TO GIB

Mk. 1. GIB Precision Vacuum Chucking Machine operating in the Plastics Division of E. K. Cole Ltd., Southend-on-Sea.

This GIB Vacuum Chucking Machine is trimming plastic mouldings at the rate of 1,200 per hour. Before its installation the rate was 600 per hour—thus GIB doubled output, saving both time and labour.

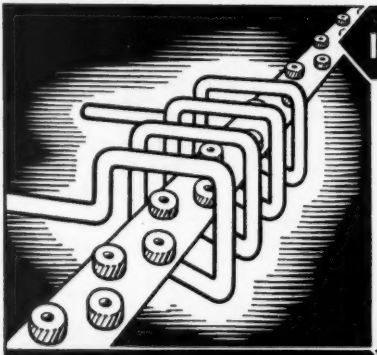
GIB precision for industry can increase production for you also—contact us regarding its application to your own special problem.

GIB *precision for industry*

Proprietors: B.G. (London) Ltd., 17-19, Stratford Place, Oxford St., London, W.1. Tel: MAYfair 1585-7.

Works: Barton Lane, Cirencester. Tel. Cirencester 726.

G.E.C.
HIGH FREQUENCY HEATING

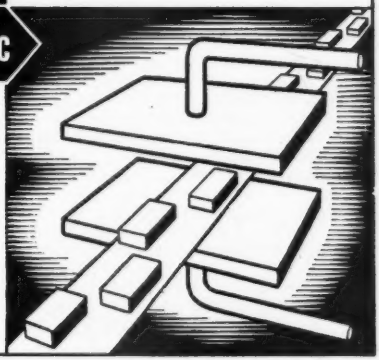


INDUCTION

- BRAZING
- HARDENING
- MELTING

DIELECTRIC

- GLUING
- PLASTIC HEATING
- DRYING



G.E.C. engineers are at your disposal to advise upon the applications of High Frequency Heating.
Generators range from 100 watts to 25 kW output.

Advt. of The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2.

5 IDEAS

THAT HELP TOWARDS NATIONAL PROSPERITY

A Free Offer to Every Business Executive

There is a remarkable unanimity as to the solution of our National problems.

It is agreed that business needs more output per man-hour.

In the last analysis National prosperity is contingent upon the prosperity of individual enterprise.

Yet not every business executive sees precisely how he can contribute towards this plan for increased production.

Here are five ideas towards this end. Every executive is offered them freely and without obligation—plus the service of a skilled consultant to help install them.

Just check them over, enter the appropriate number in the panel below and post it with your letter-heading. Details will be sent you within the twelve hours.

Note: These are only five of many such labour-saving, increased-production plans available. If your problem is not included please detail it for the attention of the Shannon Research Department.

1. **Sales.** A co-ordinated scheme for enquiries follow-ups, sales, repeats, analyses of areas and products, salesmen's figures and quotas, etc., in such a way as to yield immediate and visible facts and figures.
2. **Advertising.** A system which gives VISUAL and co-ordinated control of enquiries, results, sales, follow-ups, percentages, proofs, vouchers, correspondence, etc.
3. **Export.** A visual control plan for progressing all export details from enquiries, shipping, etc., to the final account.
4. **Factory.** A plan for controlling stocks, works orders, progressing purchases, personnel, including P.A.Y.E., material, deliveries, etc.
5. **Accounting.** A new method of "book-less" book-keeping—plus a special control system for invoices, correspondence, finance, etc.

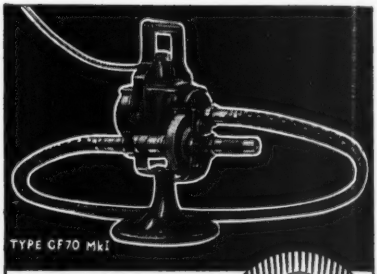
Shannon Systems

The Shannon Limited,
428, Shannon Corner, New Malden, Surrey.

We are interested in Plan No.(s)..... Please send full details as per attached letter-heading. We should also like a free specimen of the following records (please tick as appropriate).

Overdue accounts.	Medical Records.
Sales.—Prospects.	Job Records.
Customers.	Property Register.
Salesmen.	Hire Purchase.
Stock & Purchase.	Vehicle Service
P.A.Y.E. (weekly or monthly).	& Maintenance.
Personnel.	Single and Double Ledger.

(Attach to your letter-heading.)



POWER BEHIND THE CRAFTSMAN

MORE POWER TO YOUR ELBOW

Ample power—much more than is available with other types of hand-held equipment—can be applied to Flextol Shaft-driven Tools.

DESIGN

Flextol Power-driven Hand Tools are the result of careful study of modern production requirements, and special attention has been given to ensure maximum speeds of operation and dependability.

RANGE

Interchangeable Handpieces, Attachments and Accessories are available to cover the widest possible range of operations, including Grinding, Disc Sanding, Polishing, Wire Brushing, Scaling, Filing, Screwdriving, Nut Setting, etc.

SERVICE

Our Technical Staff will gladly assist in solving production problems. Advice is based on over 20 years' unparalleled experience of Power-driven Hand Tools.

TYPE R.9 handpiece with 9 in. sanding disc attachment.

TYPE R.9 handpiece with 5 in. cup grinding wheel.

TYPE D.70 drilling handpiece with side handle, feed screw and spade handle.

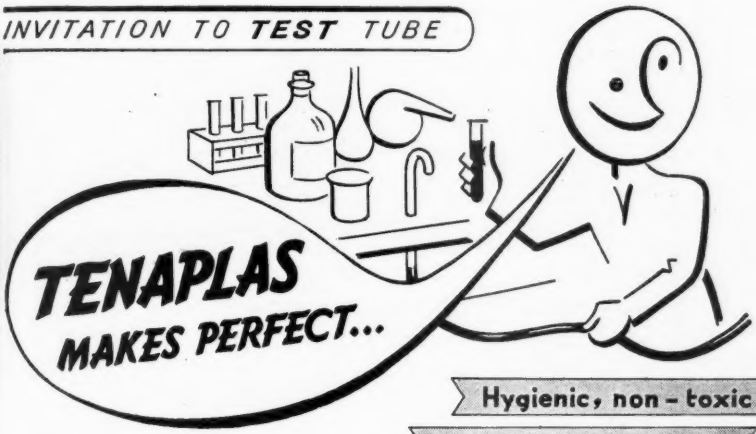
Write for Pamphlet No. F31

Flextol
POWER-DRIVEN HAND TOOLS

Sole Manufacturers and Patentees:
FLEXTOL ENGINEERING COMPANY LIMITED
THE GREEN, EALING, LONDON, W.5
'Phones: EALing 6444-5-6. 'Grams: "Dominating," Ealux, London

95-35

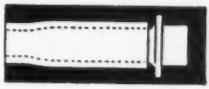
INVITATION TO **TEST** TUBE

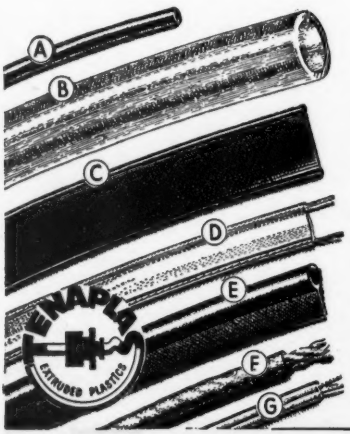


Hygienic, non-toxic odourless tubes for conveying most liquids

TENAPLAX is the name of this Tenaplas triumph in plastic extrusion. Odourless, non-toxic, hygienic—its glass-smooth finish keeps it permanently clean. Non-inflammable. Imperishable. And remarkable for tensile strength. It gives constant electrical insulation — withstands temperatures from −20°C. to +75°C. — resists almost all acids and corrosives under normal temperatures. In laboratory or factory — put TENAPLAX on trial. And count its many blessings!

● *TENAPLAX is made in continuous extruded lengths. The only jointing is at actual connecting point. Diagram on right shows end of tubing over tight-fitting Tenaplax connector.*





TENAPLAS PRODUCTS INCLUDE

(*a*) **TENATUBE** for wire sleeving; delivery of liquids.
(*b*) **TENAPLAX** for conveying liquid foodstuffs and chemicals.
(*c*) **TENATAPES** for haberdashery and trimmings.
(*d*) **TENAWIRE** Twin Flat; single and multiple.
(*e*) **TENATRIMS** for motor-car coachwork and upholstery.
(*f*) **TENAROPE** for clothes-lines, sash cord and many other uses.
(*g*) **TENAWIRE** Twin Flex, and other wires for many uses.

Tenaplas
Extruded Plastics
IN ANY DIMENSIONS REQUIRED

TENAPLAS LTD • UPPER BASILDON • Nr. PANGBOURNE • BERKS.
Phone: Upper Basildon 228 & 269 • Cables: Tenaplas, Reading • Code: Bentley's, 1st Edition • Agents throughout the world

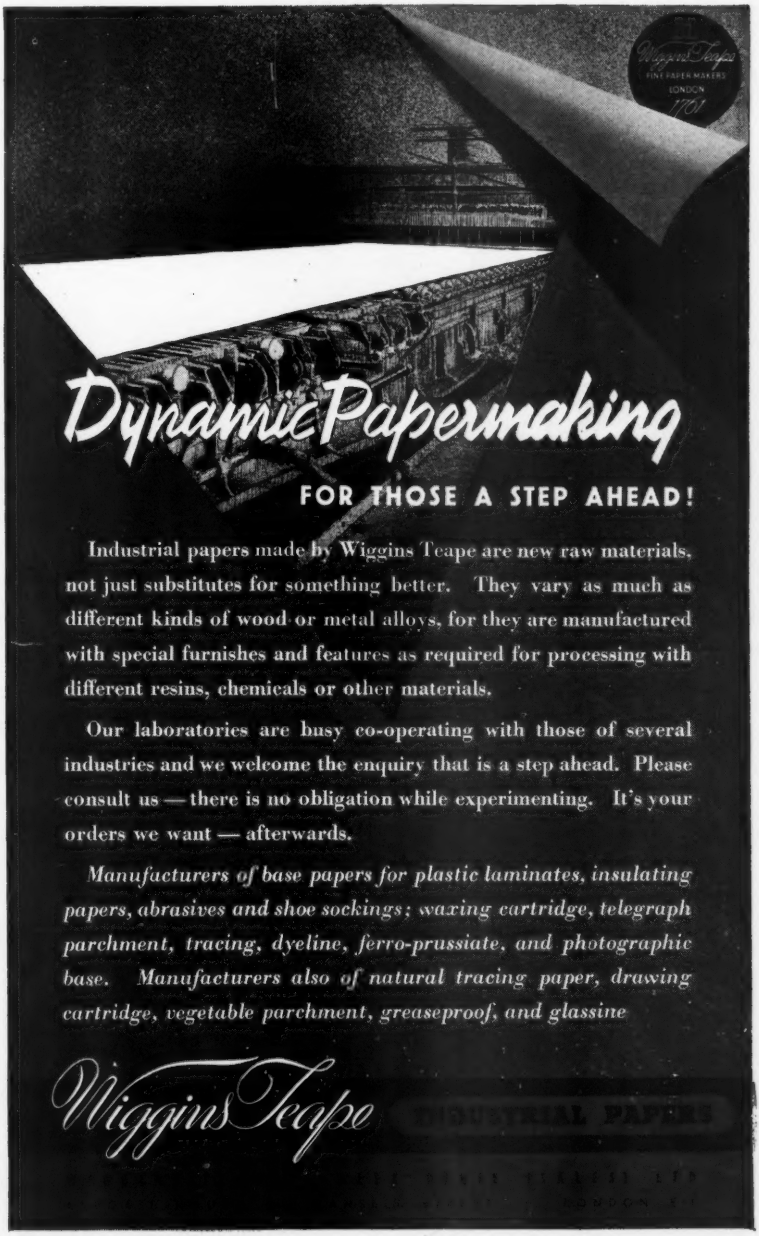
T.P.8F

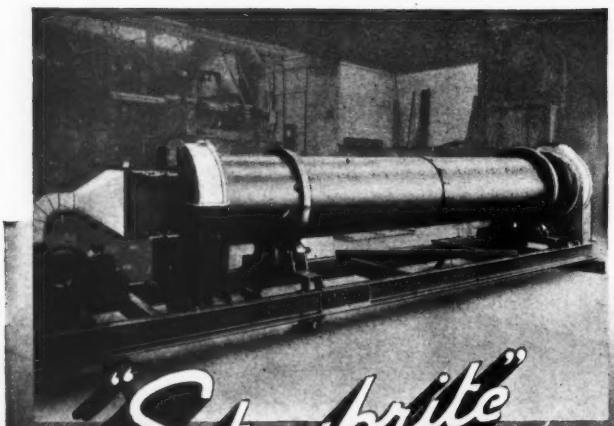
A COMPLETE
BUTTON MANUFACTURERS' SERVICE..

- "ANGLON" HAND TURNING LATHES
  (Designed by EHJ and built by East Anglian Engineering Co.)
- DUST REMOVAL, HEATING & VENTILATING EQUIPMENT
- "MASTRAL" RUMBLING BARREL UNITS
  (Wood, Metal, Plastic)
- "MASTRAL" POLISHING HEADS
- MOTORISED POLISHING SPINDLES
- POLISHING JIGS
- ALL TYPES OF POLISHING MOPS
- POLISHING COMPOUNDS
- COLLETS

Our Button Manufacturers' Service is being rapidly augmented by the addition of new lines; several interesting machines will be announced shortly. Contact our Button Plant Division for full details of the E.H.J. Service.

E. H. Jones (MACHINE TOOLS) LTD
Colindale 2011 Cables: Garenfield, Telex London
EDGWARE ROAD • THE HYDE • LONDON • NW9


Wiggins Teape
FINE PAPER MAKERS
LONDON
1761
Dynamic Papermaking
FOR THOSE A STEP AHEAD!
Industrial papers made by Wiggins Teape are new raw materials, not just substitutes for something better. They vary as much as different kinds of wood or metal alloys, for they are manufactured with special furnishes and features as required for processing with different resins, chemicals or other materials.
Our laboratories are busy co-operating with those of several industries and we welcome the enquiry that is a step ahead. Please consult us — there is no obligation while experimenting. It's your orders we want — afterwards.
Manufacturers of base papers for plastic laminates, insulating papers, abrasives and shoe sockings; waxing cartridge, telegraph parchment, tracing, dyeline, ferro-prussiate, and photographic base. Manufacturers also of natural tracing paper, drawing cartridge, vegetable parchment, greaseproof, and glassine
Wiggins Teape
INDUSTRIAL PAPERS

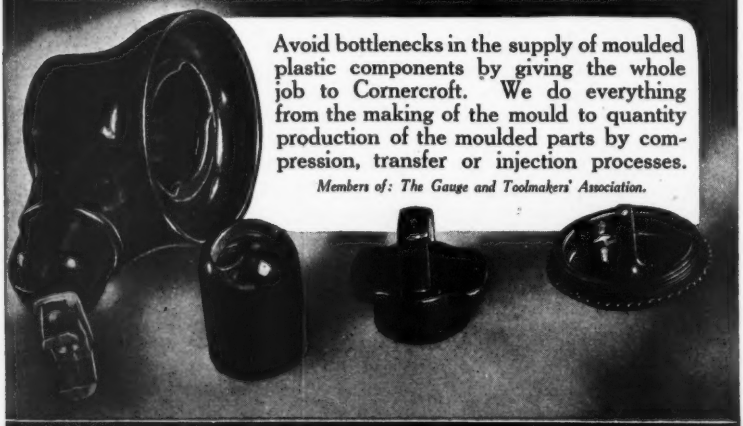


Rotary Dryer with "Staybrite" Steel lining by courtesy of Sturtevant Engineering Co., Ltd., Aylesbury.

"Staybrite" for ROTARY DRYERS FOR PLASTICS ETC.

FIRTH-VICKERS STAINLESS STEELS LTD., SHEFFIELD

CORNERCROFT DO THE WHOLE JOB



Avoid bottlenecks in the supply of moulded plastic components by giving the whole job to Cornercroft. We do everything from the making of the mould to quantity production of the moulded parts by compression, transfer or injection processes.

Members of: The Gauge and Toolmakers' Association.

CORNERCROFT (PLASTICS) LTD.

subsidiary of Cornercroft Ltd. ACE WORKS, COVENTRY

CPL11

UNITED PLASTICS & CHEMICALS (LONDON) LTD.

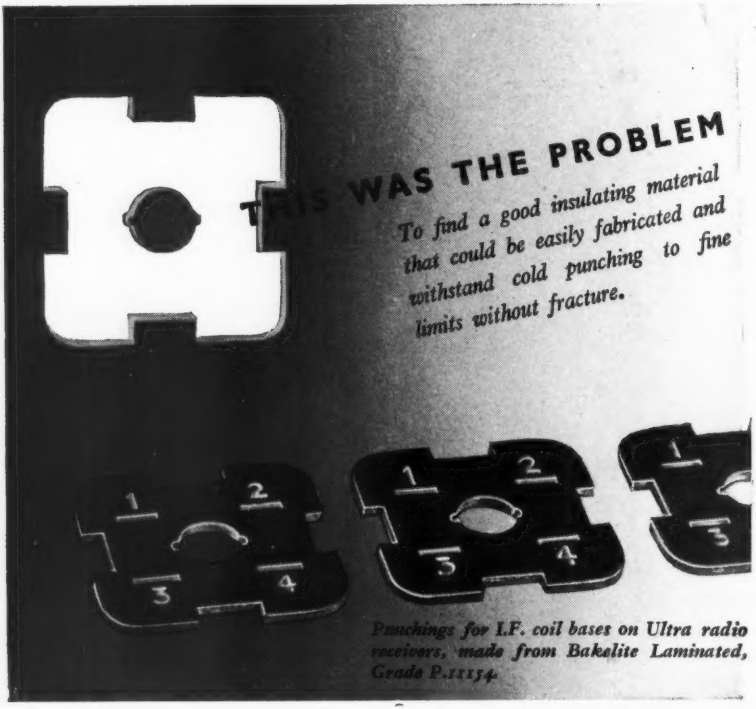
Sole Distributors in U.K. for
SYNTHETIC RESINS LTD.
of GALT, ONTARIO, CANADA

THERMO-PLASTIC MOULDING POWDERS
Cellulose Acetate and Polystyrene
Cellulose Aceto-Butyrate
Ethyl Cellulose.

CELLULOSE ACETATE AND CELLULOSE NITRATE
Sheet, Rod, Tube.

THERMO-SETTING MOULDING POWDERS
PHENOL AND UREA FORMALDEHYDE
and Phenol Resins.

73, HIGHGATE ROAD, KENTISH TOWN, LONDON, N.W.5.
Telephone . . . . . Gulliver 5466


THIS WAS THE PROBLEM
To find a good insulating material that could be easily fabricated and withstand cold punching to fine limits without fracture.
1
2
3
4
Punchings for I.F. coil bases on Ultra radio receivers, made from Bakelite Laminated, Grade P.11154.

—solved by using BAKELITE LAMINATED

In the punching of I.F. coil bases for their domestic radio receivers Ultra Electric Ltd. required an accuracy limit for the purpose of subsequent processes of plus or minus 0·002". BAKELITE Laminated met the need because the required shape could be punched cold from grade P.11154 to the specified accuracy limits. BAKELITE Laminated has excellent dimensional stability and machines readily. Altogether it is an extremely reliable material for the mass production of high-grade insulating components.

TREFOIL

BAKELITE PLASTICS

REGD. TRADE MARKS

Essential Materials for Essential Work

BAKELITE LIMITED · 18 GROSVENOR GARDENS · LONDON · S.W.1

To8

Vol. XI. No. 123 AUGUST, 1947

Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials

Proprietors - - TEMPLE PRESS LIMITED
Managing Director - ROLAND E. DANGERFIELD

Editor - - M. D. CURWEN, B.Sc., A.R.I.C.
Offices - Bowling Green Lane, London, E.C.1

CONTENTS

	Page
Editorial	396
Plastics Industry "Down Under" Looks Up ..	399
Copying Natural Horn in Button Making	404
Contact Pressure Laminates	407
World's Industry Employs Plastics	411
Softening of Thermoplastic Sheet by Radiant Heat	414
Plastics at International Congress of Pure and Applied Chemistry	420
International Congress at Welwyn Garden City ..	424
Plastics in Germany ..	426
Cellulose Acetate Plastics III, by Vivian Stannett ..	427
Letters to the Editor ..	433
Production News	435
New Productions from the Moulding Shops	437
Patent Review	439
Microscopic Examination of Plastic Materials, by J. H. Wredden	443

NOTICES

"PLASTICS" is published in London, England, on the second Wednesday of the month.
Annual subscription rate, 26/-. Shorter periods, pro rata.

All instructions, matter and passed proofs of all kinds of advertisements must reach the Head Office of "PLASTICS" by the 24th of preceding month to ensure insertion.

Head Offices:
Bowling Green Lane, London, E.C.1.
Inland Telegrams - - "Pressimus, Phone, London."
Cables - - - - "Pressimus, London."
Telephone - - Terminus 3636 (Private Exchange).

Midland Offices—5, Suffolk Street, Birmingham, 1.
Telephone - - - Midland 4117-8.
50, Hertford Street, Coventry.
Telephone - - - Coventry 62464.
Northern Offices—1, Brazennose Street, Manchester, 2.
Telephone - - Blackfriars 5038-9.
Telegrams "Presswork, Manchester."
Scottish Offices—12, Renfield Street, Glasgow.
Telephone - Glasgow Central 9036.

EDITORIALS

100 Years of British Chemistry

OURS is an industry born of chemistry, and it is well in the year when we are celebrating the centenary of the Chemical Society, the first to be established in the world, to remind ourselves of, and, if we may be so bold, to ask others to reflect upon, the not-insignificant part this country has played in the growth of our civilization in this field.

Founded in 1841 (the centenary celebrations have been delayed because of the late war) to disseminate knowledge of the science, it numbered then 25 members; to-day its membership is over 7,000 of all nationalities.

Perhaps one of the most significant parts of this celebration is an Exhibition now being held at the Science Museum in South Kensington, which links up very closely the chemical research of the very early 1800's with the drive of chemical technology of the middle 1900's.

Here are illustrated the work of many famous British chemists, such as that of Faraday, whose discovery of benzene in 1825 paved the way for the production of a host of new substances used in making dyes, drugs, perfumes and explosive materials. The romance of the discovery and preparation of artificial dyes is also shown, and includes W. H. Perkin's preparation of the first "coal-tar" dye "mauve," discovered in 1856. The story of the familiar electric sign, so much in use to-day, is taken back to pioneer work on the rare gases of which the red "Neon" light, discovered by Ramsay in 1898, is a spectacular example. The first preparations of artificial rubber are included, and many other interesting objects in the history of chemistry during the past 100 years are shown.

A modern and popular section of the Exhibition prepared by the Department of Scientific and Industrial Research, deals with the applications of chemistry to everyday life. It includes sections dealing with such things as textiles, agriculture, homes and buildings, roads and transport, fuel and power, health and food. Linking the two parts of the Exhibition is a special display explaining the processes by which the chemical engineer turns raw materials into products familiar to everyone. The co-operation of the leading research associations has been secured for this part of the Exhibition, and the Central Office of Information has undertaken the design and layout.

With this panorama before us, "it jumps to the eyes" how this fundamental work of all chemists throughout the world has affected our lives. By first understanding with what and how the molecules of the natural materials that surround us or are buried in the earth are built, and then, with equal understanding, building exactly similar or such nearly similar molecules as are desired from the simple atomic bricks, the chemist has first provided a range of new raw materials, and has then proceeded further to combine them to produce a vast range of materials, the like of which the world of the 19th century had never seen and never conceived possible.

How truly this refers to the plastics industry there is no need to relate, except, perhaps, to stress that the new plastics 1920 to 1947 era were never conceived possible to the plastics industry of the earlier part of the century.

Chemistry and Plastics

THE three days' celebrations of the Centenary from July 14 to 17 were followed by the XI International Congress for Pure and Applied Chemistry. Both were attended by eminent chemists from all over the world and many interesting papers on modern advances in the science and its

technology were read; we reprint abstracts of some of these which apply to our own industry, elsewhere in this journal.

As a grand scientific finale to the whole proceedings a visit to the Welwyn Works of I.C.I., Plastics Division, had been arranged on July 23. This proved a completely delightful and instructive visit, for not only an enormous marquee in lovely surroundings had been erected for lunch, but the whole works were thrown open to the large crowd and all the processes and research work were carefully explained by a host of technical experts and guides.

Much of the work carried out at Welwyn is of an advisory nature, but the extent of the advice given to potential customers is deserving of special mention. Thus full scale mixers and calenders for producing sheet p.v.c. were on view and working, as well as full-scale p.v.c. extruding machinery covering copper wire with the same plastic. We were also shown the new Nuron resins for producing laminates at very low pressure.

The manipulation and fabrication of "Alkathene" was another fascinating and instructive section in this part of the factory. We were able to watch the welding of boxes made from this polythene plastic by workers using hot nitrogen gas blown from a hand-torch and a specially plasticized polythene filler-rod. Here, too, were shown the methods of casting bottles of this material complete with cast screw-necks. Such bottles are obviously of immense value for holding acids and other dangerous chemicals since they are truly unbreakable. In the same "Alkathene" section we saw the production of centrifugally cast tubes, a process completely new to us but reminiscent of the centrifugally cast iron tube.

In another section of the works and following an excellent talk by Dr. Starkie on the use of polymethyl methacrylate lenses especially for the new industry of television, we were able to see how these lenses, some of them 14 and 18 ins. in diameter, were actually produced.

The moulds employed are of glass ground and polished to the extreme accuracy needed for the purpose, and are then filled with the colourless liquid monomer, methyl methacrylate, to which has been added a "light catalyst." The contents are then submitted to the rays of ultra violet light lamps, at the same time employing specially designed "stencils" to ensure correct polymerization and to avoid bubble formation in the lens space itself. Bubbles which are formed collect only in the outer periphery, which is removed. A photograph of the process is seen on p. 425.

While the plastics industry as at present constituted is generally but little interested in the textile industry, it is, in fact, scientifically and technologically, closely bound up with it. In a brilliant lecture towards the close of the proceedings Mr. Osborne described the chemical and physical structures of the natural fibres such as cotton, silk and wool by means of their known formulæ and by microscopic and X-ray pictures, how the scientist has already a very good idea of why wool, for example, has such excellent "protective" properties, and why silk, to take another example, has such strength. He then compared these with those of the synthetic varieties, rayon, nylon, the new Terylene and polythene fibres, and told how the scientist is systematically trying to design and attempting to synthesize long molecular chains according to plan to produce fibres with preconceived properties. The new synthetic fibres are far from being molecular copies of the natural ones, and indeed we may not need to copy them. What is perhaps more important is that the world is producing, and will produce, new types that have a special place in the industrial world which the natural type cannot occupy.

In thanking Imperial Chemical Industries, Ltd., we are sure we speak for more people than ourselves when we say we have never enjoyed a "scientific" day so much in our lives. It was magnificent.

Cock-eyed World

THERE is one policy on which all parties in Parliament appear to agree—the necessity to increase production greatly and to export those finished goods in the making of which we excel to countries which need them or do not make them.

Among these finished goods we find combs, once a very specialized industry, but which, with the introduction of the modern injection machine, has increased greatly during the past 10 years. Indeed, so astronomic are the numbers of combs now produced in Great Britain, we export them and fill our own shops to overflowing. Here, at least, there is no shortage, even for our own people.

Yet, to our dismay, we have received a letter from a comb factory in Denmark stating that our Board of Trade has permitted the export of £5,000 worth of combs from that country to this. It appeared to us so fantastic an arrangement that we immediately telephoned the Board of Trade for confirmation. Yes, it was so. The Danish Government had asked for permission to export £10,000 worth, but this had been cut to £5,000. The Board of Trade was non-committal as to the reason for the permit.

We are tied to Denmark by many historical loyalties and with our Board of Trade at the heart of international trades, we willingly accept the tender sentiment that " Le cœur a ses raisons que la raison ne connait pas."

But why pick on combs of all things? And why should we, most competent in such manufacture, help a nation, most expert and wealthy in agricultural industry, equip herself in this technical production? Are there no economic laws which tell us that such a movement must inevitably cut down our own similar manufactures and exports and equally inevitably force us to buy less food from Denmark?

Why could we not import £5,000 or £10,000 worth more of butter and eggs and cheese which we need so much?

Denmark has in recent years, we are glad to note, taken to the manufacture of casein. With her great milk production, we contend this is certainly one of her proper functions. Why, then, could we not import £5,000 or £10,000 worth more of it for our plastics industry, which is quite ready to buy it? This amount could be converted by us into combs and other finished goods to the value of some £20,000 to £40,000, an operation that should be very attractive to all concerned.

It might be thought that the imported combs will be of casein. We should have considered this a logical step in Danish production too, although, here again, we should still have resisted its importation. But we have strong reason for believing there is no casein-working industry. Moreover, the letter refers to " thermoplastic " material. It appears more probable that the combs are injection moulded on a machine imported from this country or the U.S.A., using cellulose acetate also purchased abroad.

We would not normally be averse to accepting the decision if we were certain that they would be truly competitive, but this we cannot conceive possible unless they were of casein. In the latter event, since the British Government finds it convenient to paralyse this part of the plastics industry by making it pay £260 per ton for casein, whereas the price in a producing country, e.g., Australia and probably Denmark, is about £60 to £70, the instance is a special one.

Alternatively, for we are not and have never been so insular nor so pig-headed as to resist advances in technical production, we should welcome combs if they gave us new ideas, such new ideas as are presented by the Czechoslovakian type reproduced on page 410 of this issue.

We do not imply that the gods wish to destroy the Board of Trade. In truth we know that this Government body is against such a lunatic policy and knows the condition of our industry. What, then, is the reason?

Are we seeing a return to international payment in " mailles noires," as was practised up to the 16th century?

PLASTICS INDUSTRY "DOWN UNDER" LOOKS UP

By Edgar Bee

AT the time of writing, a cylindrical, all-plastic household refrigerator, which its designer, Mr. J. S. Philipson, of Sydney, says is probably the world's first, is due to appear on the Australian market. The "Plast-Ice," as this refrigerator is named, is only one of a number of interesting products of an industry which is on its way from "Down Under." Making due allowance for limitations imposed by differences in populations and markets, the plastics industry in Australia compares technically with that in almost any country, including Great Britain, the United States, or Canada.

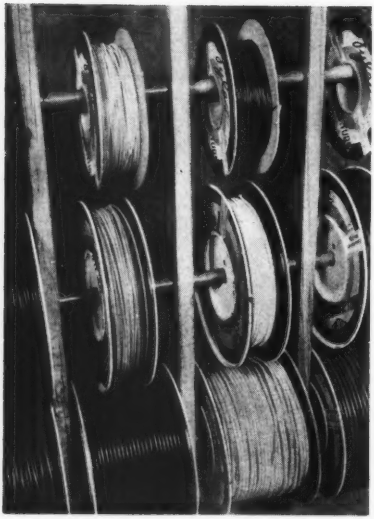
The progressiveness of the Australian plastics industry is shown by its pioneering developments. "We want to get down to our own research," says Mr. A. R. Penfold, director of the Sydney Museum of Technology. "We have the young, trained technicians; what we want is inspired leaders with wide international background." Mr. Penfold is an authority; plastics is his hobby and his job. On behalf of the Government of New South Wales he has travelled extensively, studying overseas developments and collecting items for the museum. "Ours is the best plastics display in the world," he will tell you. "No one has specialized in plastics and synthetic fibres as we have."

Mr. Penfold is one of many who think Australian plastics fabrication compares favourably with that in Britain, the United States and Canada.

His view is supported by Mr. Rod Cooper, editor of "Australian Plastics," which journal was started during the war years to fill an obvious need in a rapidly expanding industry. Mr. Cooper has said: "Our industry is getting closer every day to plastics practice in England and the United States. We are using the same materials for the same types of jobs. One American and two English experts in Australia recently said the general standard of plastics manufacture here is extraordinarily high. Overseas experts tell me they are very impressed with the technical forwardness of plastics toolmakers here, who very often have done jobs considered impossible in other countries."

The Australian plastics war record is particularly good. In the use and manufacture of phenolics, alkyds, ureas, cellulose acetates and vinyls, there were very great developments. The industry did jobs previously classed "impossible" because it had to; it provided countless moulded items, including all sorts of radar and radio components, and even such things as waterproofed plywood airscrew blades from waste timber.

The "Plast-Ice" cylindrical refrigerator has unorthodox construction, giving a storage capacity of seven cubic feet.



"Nylex" p.v.c. insulated wires, cable and flex, suitable for 250-volt and 660-volt circuits, manufactured according to B.S.S. specifications by Moulded Products (Australasia) Ltd.

The tie-up between timber and plastics in Australia is strong in various respects. Australia has a great supply of these raw materials, with about 3,500,000 tons a year of wool waste, and large stands of second-class timber.

Densified Woods Pty., Ltd., of Sydney, pioneered some of these developments. They were most successful in the manufacture of airscrew blades from low-grade Australian timbers by densifying and impregnating with phenolic resins, then moulding under pressure. Laminated axe and tool handles made by this company have great strength and are warp-proof because the impregnating medium is waterproof. More interesting is the company's plastic ski, which in exhaustive trials has proved highly successful. So far as is known, there is no comparable product anywhere in the world.

Slazengers (Australia), Pty., Ltd., sporting goods manufacturers, went over to ships' dories for war purposes. These, of Australian timbers, using a laminated construction and Australian-made resins, were made in large numbers up to 45 ft. in length. The company is now converting to laminated tennis rackets.

The total war-time output of laminated plastics in Australia was about £A200,000 a year.

Extruded wire coverings were an important war contribution of the Australian plastics industry. Most of these came from the factory of Moulded Products (A/sia), Ltd., of Melbourne. This company is now turning its war-time experience to good account in making plastic braces and belts; also plastic garden hose, a 60-ft. coil of which can be carried on one finger. The weather-resisting and general wearing qualities of this garden hose are claimed to be much better than for rubber, while attractive colourings are a big selling aid.

Commonwealth Moulding Pty., Ltd., of Sydney, made good a vital shortage in spectacle frames, and overcame many technical difficulties to do so. This product was previously made, it is understood, by only three or four plastics manufacturers overseas. Production has now reached a level where the company not only meets the Australian-wide demand, but can also export. The frames have been sold to America, among other places. Blanked and machined nitrocellulose sheet could not be supplied to the company during the war, and an alternative material had to be found. This involved an entirely new approach to the problem, and a radical departure from accepted practice. The technique and methods adopted showed that Australian technicians were keeping well abreast of their fellows overseas, and ahead of them in some avenues.

Natucryl Manufacturing Co., of East Preston, Victoria, because of war-time shortages of porcelain artificial teeth, patented a process to manufacture artificial teeth from acrylic resin. These teeth, the company claims, are "acknowledged by the profession to be superior to the imported article, particularly from the point of view of appearance."

(Left) Range of articles made by Australian plastics manufacturers. Items shown include telephone, battery case, bowls (complete and half-section), fuse box, spectacle frames, section of plastic chain, and artificial teeth.

(Above) "Nylex" plastic evening shoe, by Moulded Products (Australasia) Ltd., Melbourne. (Left) "Duperite" table lamps with shades of reflector bowls made from "Nylex," by Moulded Products (Australasia) Ltd.

Milton Bros., of Sydney, evolved a plastic-and-glass eye-dropper as an example of war-engendered ingenuity, rubber shortages having ruled out the usual type of bulb. Although it had previously been considered impossible to satisfactorily weld plastic to glass, Milton Bros. did it, and thousands of their eye-droppers went to Service posts throughout the Pacific area.

The plastic fabrication of many articles previously made of metal, such as door knobs and meter cases, has also been pioneered in Australia.

One outstanding operation performed in Australia for the first time anywhere in

the world was the moulding of a plastic skin over die-cast automobile handles. This was done in 1935 by Die Casters, Ltd., of Melbourne, using Tenite powder and an Eckert and Ziegler injection press.

Virtually a world monopoly in plastic moulded playing bowls has been built up by W. D. Hensell and Co., of North Melbourne. They began this line in 1931, and, for a number of years, have been exporting to all Empire countries. The ordinary playing bowl is about 5 ins. through its thickest part. Normally, it would be impossible to mould bowls because of this extreme thickness. But when Dr. N. H. Lang, Ph.D., A.A.C.I., now in private practice in Sydney as a consulting chemist, developed Ellitane, a phenolic powder, while working with Elliotts's Australian Drugs (now Beetle-Elliott Plastics (Proprietary), Ltd.), the "impossible" became possible. Hensell bowls, wholly Australian in materials and manufacture, hold many records. The old-style bowls turned from wood have to be re-turned after a while, whereas the phenolic bowls are completely stable and do not warp.

In 1928 Cook and Williams, of Melbourne, developed an ingenious method for unscrewing undercut switch cap mouldings from dies. English moulders adopted the arrangement in 1931.

These examples of war and pre-war achievements are far from exhaustive. The complexity of the plastics industry in Australia and the way in which it ties up with other branches of manufacture makes an assessment of its size difficult. However, a survey of the moulding industry showed that in 1942-43 there were 113 companies engaged in moulding plastics, and that 41 of these companies had entered the industry after the outbreak of the war; all but four were in New South Wales or Victoria. Sales approximated £A1,000,000 a year—double the pre-war volume. Plastics moulders and fabricators now employ more than 2,000 people, and have probably more than £A1,000,000 invested in the industry.

It was estimated in the Tariff Board Report on the plastics industry, published March 14, 1946, that the quantities of various types of synthetic resins likely to be used in Australia after the war were:—

	tons
Phenolics	2,200-2,500
Alkyds	1,200-1,500
Ureas	700
Cellulose acetates	800-1,000
Cellulose nitrates	600
Vinyls	400-750
Polystyrene	50
Acrylics	50
All others	50
Total	6,050-7,200

The Australian plastics industry is about 25 years old, for one manufacturer, Mr. F. S. Dalton, using phenolic resin of his own make, was moulding buttons for army greatcoats in 1917. To-day, the industry is, roughly, in the same position as was the radio industry 20 to 25 years ago; it is just beginning to find its feet, thanks to war-time technical advances and the installation of modern machinery, much of it Australian made.

Supply of New Materials

For many years the backbone of the industry has been the ordinary phenolic type—the Bakelite family. These resins have been used for moulding, for surface finishes, impregnating for radio and technical purposes, as paper laminated products, and waterproof adhesives for plywood.

In the raw materials of the phenol-formaldehyde group, Australia is practically self-supporting. Several factories make quick-setting low-temperature water-soluble phenol-formaldehyde glues. The war retarded development of cast resins, which were being made on a restricted scale.

Recently, in Sydney, the manufacture of urea-formaldehyde resins was begun; these are used in such Australian products as Beetleware and Nallyware. Apart from urea resins and the phenolics, practically all plastic materials are imported.

The Monsanto Chemical Co. of America is firmly established in Melbourne as Monsanto (Aust.) Pty., Ltd. English interests are also developing the manufacture of plastics raw materials. Yet Australia, of course, has most of the basic raw materials required should the growth of

the plastics industry warrant their exploitation: coal and petroleum (from shale) for phenol; timber, to yield methanol by distillation; waste product from paper mills, to give lignin; wood fibres for plastics in the Masonite group. Glycerine, linseed, coconut and castor oils are produced locally. The protein-type plastics are already made from Australian-produced casein.

Mr. Cooper, editor of "Australian Plastics," considers that there is a big field developing in Australia for polyvinyl chloride for such products as raincoats, shower curtains, tobacco pouches, etc., although a cheap source of acetylene is needed. "These plastic materials," said Mr. Cooper, "are particularly important for the textile trade. You can get a calendered sheet of p.v.c.; you can get extruded fibres, such as nylon; and you can also get combinations of ordinary textiles with plastics, giving superior qualities to the finished article. Melamine, for example, can be combined with rayon and increases the sheerness of the stockings."

However, Mr. Penfold considers that Australia is "going to be handicapped in all those materials grouped under 'transparent plastics.'" Despite the progress and healthy condition of the industry, he is not entirely uncritical when he says: "We want to get away from making the same old lines in the same old shapes, designs and styles as overseas. We want to develop our own shapes and styles. And we need to lower prices, for I think the prices of plastics are too high, and this is retarding the industry's progress."

Prices for plastics in America are generally somewhat higher than in Australia. But in Great Britain prices would be somewhat lower than in Australia.

Exports of Australian-manufactured plastic products at present are not very high, but, disregarding imponderables, such as Japan's future, prospects are considered to be good. Expansion of exports appears at the moment to depend on getting the raw materials; the industry is very well provided with production plant, presses and other equipment. Some plastic items little known to the Australian public have been made for export, for example, toothpicks.

Australia, like other countries, is passing through a period of industrial adjustment. While the plastics industry itself has been directly affected hardly at all, labour conditions in it being very fair, indirect effects have inevitably been felt from the disturbed condition of industry generally. However, this post-war headache is transient, and when things settle down the plastics industry will form an important part of the general economy.

It is fully realized that plastic materials are so versatile; very few secondary manufacturers do not use them in some form. In the Australian-built motorcar, plastics are being used for the surface finish of the body and steering wheel, instrument panels, safety glass and upholstery; and in the electrical industry they enter into distributor heads and timing gears. Even iron foundries use plastic resins for stiffening sand cores.

The Plastics Institute of Australia, formed two years ago, is now a Federal body with divisions in New South Wales, Victoria and South Australia. The Institute is particularly interested in quality control—the laying down of standards for various types of manufacture. Sydney Technical College is already giving lectures to train plastics workers on the theoretical side; practical instruction is being considered. Still more important, the New South Wales Government have allocated £40,000 for a School of Plastics. The New South Wales Department of Reconstruction is showing considerable enterprise in developing and encouraging the industry.

ETHYL SILICATE AS BONDING AGENT.—Mr. A. E. L. Jervis, author of the article which was published in "Plastics," July 1947, page 360, writes to us pointing out that the so-called "silicones" referred to are more correctly described as "siloxane polymers." The word "silicone" is a misnomer, but has come to stay. What we now know as "silicones" or "silco-ketones" are not silicon analogues of ketones, as was originally thought.

H

Copying Natural Horn in Button Making

THE making of plastic buttons can be a task beset with difficulties when questions of colouring arise. This is particularly so in cases where the buttons have to harmonize with the cloth upon which they are to be sewn.

Hornflowa, Ltd., of Maryport, Cumberland, are primarily manufacturers of moulded plastic buttons. They produce these using their own raw material, which is a urea-formaldehyde horn-meal compound of characteristics suitable for compression moulding. Some examples of their work in this direction are here illustrated, from which, even in monochrome, it will be seen that buttons can have depths of colouring and variety of mottling which are distinctly their own. Speaking for ourselves, we well recall the pleasure which was afforded us in our childhood by sorting over a box of miscellaneous buttons cut from real horn. Those who formerly employed horn in the making of high-class buttons were distinctly critical of what would, or would not, be usable in the raw material.

Compression moulding, as applied to the manufacture of plastic buttons by Hornflowa, Ltd., has made remarkable strides towards imitating the natural horn. It has now progressed one stage farther in a new process for giving the mottling to such buttons. The process has developed over a period of several years, but the results are upon the market for the first time this year, having been shown at the recent British Industries Fair.

Whereas most mottling processes have either the disadvantage of being purely superficial (for instance, by spraying) or have a too sharply controlled design (for instance, by extruding), the new process claims to give a "through-going" mottle with colour effects which have an exceedingly natural appearance. Both the process and the tools employed are com-

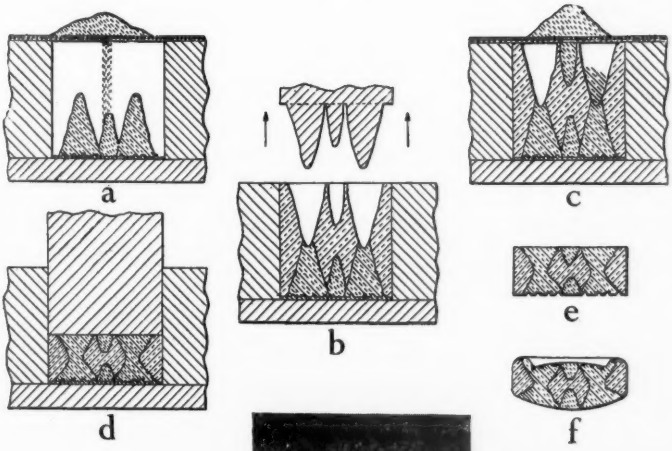


Fig. 1.—General principle of building up moulding powder in mould cavity according to British Patent 566,837 (various intermediate stages omitted).

(a) Primary heaps of coloured powder arranged at bottom of mould by aid of stencils.

(b) Available space is filled with transparent powder, and impressions are made for addition of more coloured powder (c) in form of inverted heaps.

(d) Powder in mould is compressed, to give tablet (e), which assumes button-like shape (f), prior to finishing.

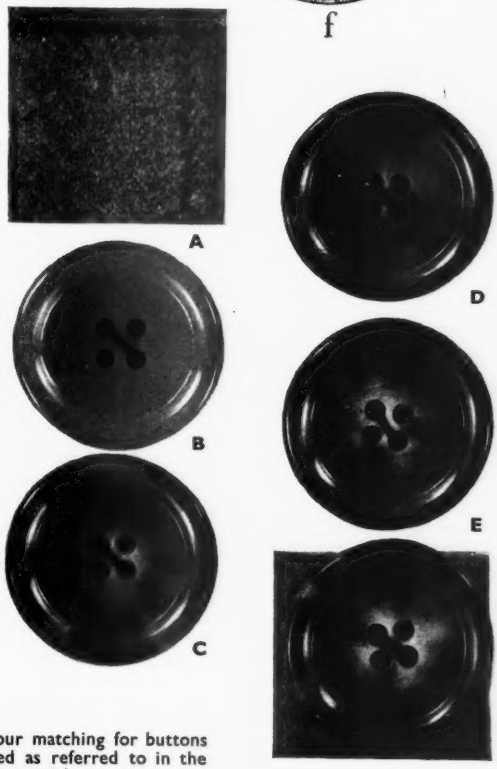


Fig. 2.—Stages involved in colour matching for buttons to be used upon Harris tweed as referred to in the accompanying article.

plicated—as might be anticipated from the intricate nature of the mottling in any product which is to closely resemble natural horn.

According to British Patent No. 566,837, in principle the process consists in building up various heaps of coloured moulding powder in the mould cavities by aid of stencils, through the holes of which the powder passes for greater convenience in making the heaps. The space between and around these heaps is then filled with transparent moulding powder. Following this operation, an impression of the negative of the heaps is made at the top of the mould cavity and, in turn, the space is again filled with the coloured moulding powders.

When a charge formed in this manner is subsequently compressed, the tips of the various heaps will touch one another and so give a "through-going" mottle. This will be made clearer by reference to the accompanying diagrams (Fig. 1). It is the building up of heaps in the manner described which gives the merging effects of a mottle which is truly characteristic of natural horn.

The new process is particularly adapted to colour matching, as where special buttons may be required for use upon a Harris tweed. After careful examination of a submitted sample of the cloth, Fig. 2 (A), for which a natural horn-like, well-matching button is required, tests are made to decide the most satisfactory colour for the basic moulding powder (B). To give the desired mottled effect, a contrasting colour is first superimposed on this basic ground B in suitable pattern (C). A second contrasting colour is then superimposed on C to brighten the whole colour scheme, with the result (D). In order to improve still further one of the natural characteristics of true horn, and simultaneously give refinement to the finished button, a centre of whitish tone is incorporated (E). When the finished button (F) is sewn upon the cloth which it is intended to match, it will be seen that the effect is distinctly praiseworthy.

The buttons shown to illustrate our explanation were made at successive stages of the process, but, lacking a reproduction of the actual colouring, limitations imposed by printing in black and white have to be allowed for in assessing the real value of this new process.

Awards for Encouragement of Young Craftsmen

Two years ago the Worshipful Company of Horners made a generous gift of 50 guineas to the British Plastics Federation to be expended at the discretion of the Council in providing prizes for the encouragement of young craftsmen in the industry. This gift has now been made in perpetuity by the Company.

No entries were received in the first year, but this year a number of entries were received from young craftsmen, all of which were of a very high standard. As a result of expert adjudication the Council decided to award four prizes, as follows:—

Design for a Mould

First prize, £15, to Mr. W. Westwood, employed by Fox and Offord, Ltd., for his entry "Single impression injection mould for cell lid (automatic ejection)."

Second prize, £10, to Mr. E. L. Sames, employed by the Streetly Manufacturing Co., Ltd., for his entry "The general arrangement of a compression mould to suit design of plastic bicycle wheel rim."

Drawing for General Arrangement of Moulding Tool

First prize, £15, to Mr. F. Seed, employed by United Ebonite and Lorival, Ltd., for his entry of a drawing of an ashtray base.

Second prize, £10, to Mr. T. Middleton, employed by United Ebonite and Lorival, Ltd., for his entry "General arrangement of four-impression tool for producing barrel."

A pleasing ceremony took place at a dinner of the Worshipful Company of Horners held in the Vintners Hall, July 22, when the four prizewinners were entertained.

The Chairman of the British Plastics Federation, Mr. W. Charles Waghorne, presented the prizes to the successful candidates.

Contact-pressure Laminates

THE term "contact-pressure laminating" has been introduced to describe techniques made possible by the development of an entirely novel class of resins. This technique is distinct from "low-pressure laminating," which is done with resins at pressures up to about 250 lb./sq. in. Stress was laid upon this point of difference in a paper which Dr. E. G. Williams read before the joint meeting of the Plastics Group of the Society of Chemical Industry and the London Section of the Institute of the Plastics Industry on March 11, 1947.

Dr. Williams confined his attention to the new contact laminating resins, which cure by double-bond polymerization. As regards pressure understood by the term "contact pressure," he said this was limited to one atmosphere or less, as in the use of the vacuum rubber-bag technique. All resins of the "contact-pressure" class give first-class laminates under these conditions, although pressures up to as much as 50 lb./sq. in. were sometimes employed with advantage.

Definite properties are required for a good contact resin. The resin should have a 100 per cent. solids content, i.e., it should not contain solvent or diluent which does not itself interpolymerize. It is also essential that little or no evaporation takes place during the laying-up of the impregnated fabrics when laminates are being assembled, otherwise serious losses of resin will take place. Under conditions of polymerization or cure, no volatile product should be formed, thus avoiding a bubbly laminate. Additionally, such resins had to be available in viscosity suitable for impregnation purposes; the most suitable viscosity for use with fabrics was in the region of 3 to 10 poises at room temperature, but a lower value was preferred with paper.

Resins for contact-pressure laminating must be easy to catalyse; they must have a long life in the uncatalysed state and an appreciable pot life after the catalyst has been added. The resins are usually supplied in the uncatalysed state, containing a very small quantity of stabilizer, such as hydroquinone. Under these conditions they are normally stable for at least six months. Peroxide catalysts, usually benzoyl peroxide or lauryl peroxide, are commonly used in the proportion of about 1 per cent. to initiate polymerization.

Curing should not take longer than 30 minutes at 100 degrees for laminates up to $\frac{1}{4}$ in. thick. In order that the laminate may have good mechanical properties, the liquid resin must cure to a hard, rigid, non-brittle solid. Resins which give only soft, rubbery polymers are of little value; excessive cross-linking gives resins which are too brittle.

In order that the resin may cure to a hard, rigid thermo-set material, it must contain an appreciable number of active double-bonds. The most common form of resin consists of a short-chain type of molecule, with the active polymerizable double-bonds spaced out at intervals down the chain. The resins which have been produced so far fall into one of four classes: (a) Ethyl, methallyl and crotonyl derivatives; (b) maleic-acid derivatives or alkyd types; (c) acrylic derivatives; (d) vinyl compounds.

The allyl compounds were among the first to be introduced as contact-pressure laminating resins; the simplest is diallyl phthalate, the diallyl derivative of diethylene dicarbonate is another such resin. Esters of maleic acids, while difficult to polymerize on their own, will interpolymerize very readily with other double-bond compounds. Maleic anhydride and ethylene glycol condense to give a chain in which the double-bonds of the maleic-acid groups are separated by a chain length of 6 atoms. In order to make compounds of this type readily polymerizable, they need to be mixed with some other monomer, which, in

itself, is readily so; the material commonly used is styrene, mixed with the alkyd resin in proportion up to 50 per cent.

Resins of the acrylic type are fast curing, and inhibition by air or rubber is considerably less than with other types. The possible varieties are great. Hydroxy ethyl methacrylate reacted with any molecule having terminal carboxy groups (e.g., idipic acid), gives a dimethacrylate (e.g., dimethacrylyl-glycol adipate). On similar lines, the synthesis of chain molecules with terminal vinyl groups gives the fourth class mentioned.

The new contact resins can only be employed economically in specialized uses, where advantages outweigh their extra cost in comparison with the conventional phenolic and urea resins. Their chief advantage is ease of application and absence of need for expensive presses. By comparison with phenolic resins, there is no risk of operators contracting dermatitis. The resins, after impregnation, are immediately ready for use and do not require any drying treatment. Rapidity of cure at low temperatures of the order of 100 degrees provides for attaining quick cycles.

One of their most promising uses is in sandwich construction, i.e., in the laminating of strong skins on either side of a low-density core. Most of the common types of core will not stand up to the full pressures needed for laminating with the conventional resins; the sandwich structure, moreover, can only be built up by glueing together the finished core and skin components. With contact resins, on the other hand, the complete sandwich construction can be made in one process.

By these advantages in the use of contact resins it has been possible to develop successfully the construction of large shaped articles, such as boats, suitcases, articles of furniture, etc., especially where, due to size or double curvature, the use of the conventional laminating press is out of the question.

The production of continuous laminated sheet is also possible; this is a comparatively simple process once the need for pressure is eliminated.

Satisfactory laminates can be prepared with almost any type of fabric. For common uses, cotton cloth is quite suitable. Very high strengths are possible with glass fabric, but cost is proportionately high. Asbestos fabric has also been used successfully. Paper, normally, is not very suitable, because many of the resins are rather too viscous for a thorough impregnation of the close fibre structure. Apart from cloth, felts or mats may be employed. The use of glass fibre mats is an interesting development; when properly laminated they give products which are fully equal in strength to those obtained when using cloth. These mats will eventually be produced much more cheaply than woven glass cloth.

Impregnation of fabric is usually carried out by running it through a bath of the resin, followed by suitable squeegee rollers adjusted to give the required resin content to the cloth. For continuous sheet, the impregnating bath is integral with the rest of the laminated equipment. For other work, it is usual to reel the impregnated fabric and store it in the wet-rolled condition until required.

The production of continuous laminated sheet is carried out by passing the requisite number of plies through a pair of rollers, which squeeze them together and, at the same time, apply a surface layer of Cellophane (as parting agent) on each side. The assembly is then passed through an oven, where the temperature is brought to 100 degrees or higher.

When making shaped articles, the tailored pieces of impregnated fabric are laid up on a suitable former and smoothed down by hand. The viscosity of the resin is such that they adhere well and air bubbles are easily removed. Sufficient plies are laid down to give the required thickness of laminate. The assembly is covered with Cellophane, a shaped rubber bag is applied and evacuated, and the assembly is then heated in an oven or by means of steam coils.

BOOK REVIEWS

Dictionary of Plastics. By Paul I. Smith. pp. 168. Hutchinson's Scientific and Technical Publications. 15s.

A dictionary especially devoted to the plastics industry is a most desirable thing, and Mr. Smith, who has been a close observer in it for many years in both literary and technical senses, is a most suitable person to compile such a book. As a result it contains almost everything that is required by workers inside and outside the industry, and we hope it will eventually prove a standard work.

On the other hand, since the plastics industry is a conglomeration of engineering, chemical and physical sciences, this dictionary, in composition, is very unlike other technical dictionaries, but it is far from being a hotch-potch of information.

Like most technical dictionaries it is easy to criticize this one, the first of its kind, not only because most of us have our own ideas of what the composition should be, but also because of sins of commission or omission. Of the latter we need not be too critical, since the change in our industry is so rapid that hiatuses must occur.

Some faults are merely typographical errors and are here noted for the printer's edification. Among these are " dithrocarbamates " for " dithiocarbamates," " Bonderzing " for " Bonderizing," " Fame-proofing " for " Flame-proofing." A similar lapse is noted also under " Benzene," which is described as " benzol, coal, naphtha, etc., for " benzol, coal-tar naphtha, etc."

Other faults which Mr. Smith may not describe as faults are: the use of the word " bakelite " as a generic name on p. 12 under " Aerolite "; the general use of initials for certain chemicals, especially plasticizers; " lubricate " used as a noun (see under " bagasic plastic compounds "); the heading under " Pendulum " which refers to impact strength testing machines should be cut and transferred to " Impact Machine." The most curious error, however, is under " Benzoic Acid Derivatives," which are elaborated as ". . . most important are diethyl succinate and dibutyl succinate." Succinic acid bears no chemical relationship to benzoic acid except that they are both acids.

We are glad to note the inclusion of B.S.I. standards and also of trade names. The latter are extremely important nowadays and perhaps the author will consider their inclusion in future issues as a separate entry.

Introduction to the Chemistry of Silicones. By Eugene G. Rochow. pp. 173. New York: John Wiley. $2.75. British Agents: Chapman and Hall, Ltd.

Mr. Rochow has produced a competent account of the chemistry of silicones as would be expected from the large number of patents which have been taken out on this subject in his name. He is well qualified to produce a book on this subject, for apart from his patents he is engaged upon this subject in the research laboratories of the General Electric Co. of America. The volume he has now written should appeal to both chemist and engineer. In this survey of present knowledge upon organo-silicon chemistry, he delves into the covalent nature of silicon and the silanes in such a manner that the reader has a fundamental knowledge of the problem before coming to the subject of silicone polymers.

There is a full list of reference to Professor Kipping's work on organo-silicon chemistry at University College, Nottingham. These papers have now become classic and many English firms are somewhat distressed that they did not look into the technical possibilities of Kipping's work. Kipping's first paper of importance on this subject was published in 1901, yet it was not until the 1930's that the Dow-Corning Co., and the General Electric Co. of America, became interested in silicone polymers.

One of the interesting aspects of organo-silicon materials is that the methylchlorosilane in the vapour phase reacts to produce water repellent films on many types of surface.

Injection Moulding of Plastics. By Islyn Thomas. pp. 534. Reinhold Publishing Corporation, New York. British Agents: Chapman and Hall, Ltd. 60s.

The process of injection moulding of plastics has reached such dimensions and is so much closer to mass production than any other type of plastics manufacture that it may well outstrip any other mechanical method. In 1946 there were nearly 3,500 injection moulding machines in the U.S.A., where contemporaneously the production of thermoplastics has reached record heights. Mr. Thomas, who is president of the Thomas Engineering Corporation,

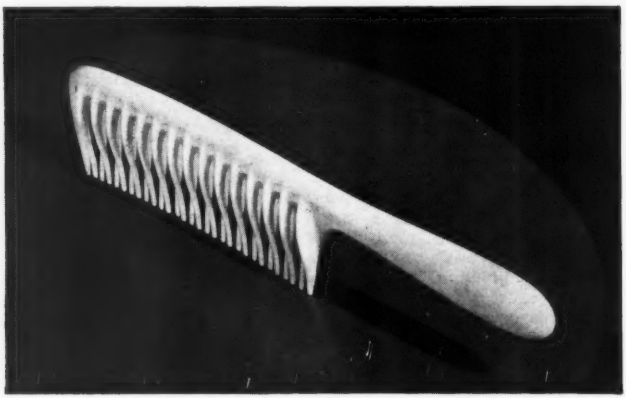
Newark, N.J., is most eminently fitted for the production of this book in view of his extremely wide experience in this specialized field. He has, in fact, produced a monumental work, unique in design, completely balanced and eminently satisfactory from an engineering point of view.

The opening chapter gives some inkling of the research that Mr. Thomas has carried out, for he delves into the history of the subject in order to give his readers the background from which the industry sprang and thence to show the way we are going. The description of Hyatt's machine in 1871 and of the production of celluloid teeth and buckles in the 1870s and 1880s is as fascinating as it is important. Chapter II, the longest in the book, deals with the more or less modern development of injection moulding. In this there are described with very complete details almost every known injection moulding machine in the world.

An excellent chapter, too, is the third, under the title of "Moulding Practices," which covers most adequately plant and layout, machine maintenance, moulding practice and moulding difficulties. An excellent section of this deals with the problems of moulding individual thermoplastics—invaluable, since each has different properties and "idiosyncrasies."

The remainder of the book covers product and mould design, finishing and decoration, estimating costs, etc. Appendices give complete physical data of thermoplastics and their evolution.

Both author and publishers are to be congratulated on this production, which places on record a clear and factual record of this branch of engineering science.

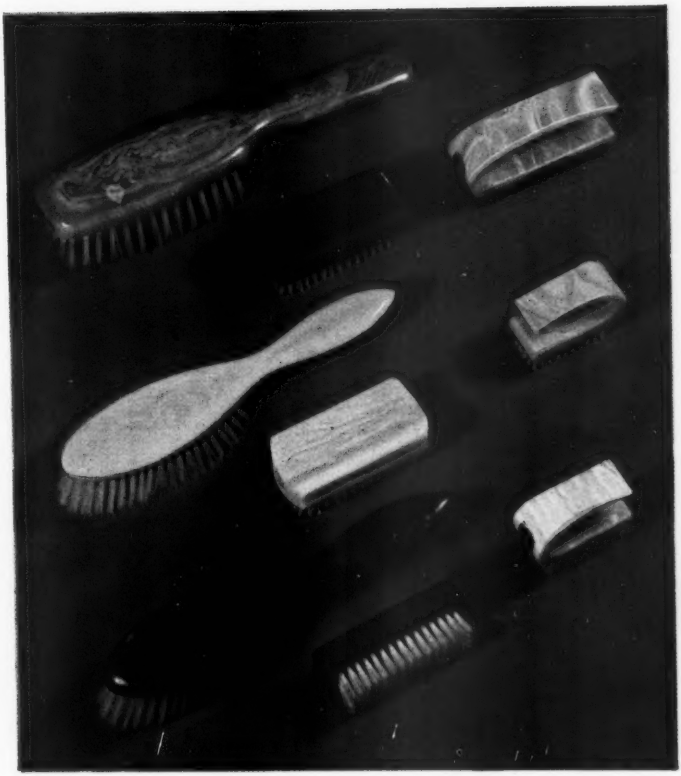


Comb from Czechoslovakia

A most interesting new design is that shown in the accompanying photograph. We received a sample of the original from a Mr. Slavatsky, a well-known moulder and mould-designer of Brno, Czechoslovakia. It is obviously a specialized product for a very specific purpose and although it has been produced in that country for a number of years, we believe it to be new to this. Its purpose may be described as a "detangler," the nearest we can approach to the French word as written to us. In other words, it is mainly intended for children whose long hair is notoriously tangled and painful to comb. Obviously, there is a very definite market for this type in all countries.

The comb weighs about 2¼ oz. and is 10½ ins. long. There are two rows of wide-spread teeth which curve inwards to the same axial plane, but are still wide apart. The design and thickness of the teeth and the comb as a whole makes it extremely strong and most suitable for the purpose in view.

From a moulding point of view the brilliance of the job must lie in the design of the mould and in its construction.



The modern toilet brush, with the range of plastics, colours, textures and shapes now available, has resulted in a new standard of beauty and utility attained by none of the old traditional materials.

The above examples have been manufactured by G. B. Kent and Sons, Ltd., of London, using Catalin, the well-known cast phenolic resin.

World's Industry Employs Plastics

GENERAL ENGINEERING

Plastic Bearings.—H. Conradt states the numerous advantages which would result from a planned system for investigations. His suggestions deal with bearing diameter and length, peripheral speeds, wall thickness, bearing clearance, bearing loads, calculation of bearing friction, calculation of friction heat, and graphical representation of the results. The influence of surface finish, however, has not been dealt with. ("Kunststoffe," 1946/**36**/85.)

Cemented bond for use between brake shoe and lining has been developed by Goodrich Tyre and Rubber Co.; it replaces the usual riveting method. Larger contact area between lining and brake drum gives better performance. ("Machine Design," 1947/June/109.)

Foundry patterns of laminated plastics, particularly resin-treated wood known as Lignofol, are described by H. Kalpers. ("Werkstatt and Betrieb," 1947/April/87.)

Extruder screws.—W. P. Moeller and R Phillips describe experiments on a small laboratory machine to determine the efficiency of extruder screws. Production rates in dependence of the screw speed were determined for Lumarite, Celcon and Forticel. ("Industrial Plastics," 1947/June/7.)

Grove designs for non-moving and moving types of O-ring seals in hydraulic units, and other applications, are discussed by R. E. Allen ("Product Engineering," 1947/June/163). Typical arrangements are shown for sealing cylinders, pistons and caps, valve covers, and adjustably threaded components.

Glass fabrics impregnated with phenol resin have been investigated by F. Bollenrath from viewpoint of influence of design and of production methods on mechanical and physical properties. Tensile strengths of 33 to 80 kg./sq. mm. are reported. The endurance strength is relatively high and reaches 75 per cent. of the tensile strength. ("Kunststoffe," 1946/**36**/73.)

Elastic locking collars made of nylon, for use with their safety nuts, are now supplied by Elastic Stop Nut Corporation. ("Scientific American," 1947/June/272.)

Toggle arrangement is used in the injection moulder of Crown Machine and Tool Co. for locking the moulds by hydraulic means. The machine is intended for handling all thermoplastics at comparatively low pressures and high rate of feed. ("Machine Design," 1947/June/154.)

Dimensional tolerances are obstacles to greater use of phenolics, compared with metals, but S. K. Moxness ("Mechanical Engineering," 1947/June/479) shows that close tolerances can be held for multi-cavity mouldings as used for complicated instrument parts.

MISCELLANEOUS

Corrosion of steel pipes for oil-well drilling is prevented by thermosetting plastics coating. The difficult problem of finding a plastic which is corrosion and heat-resisting and can be forced into the tubes of 30-ft. length has been successfully solved by the Spang-Chalfant Division of National Supply Co. ("Scientific American." 1947/July/31.)

Silicone rubbers are finding important application for internal-combustion engine gaskets; apart from withstanding high temperatures and pressures, they are non-adherent to metal and other materials at high temperatures. ("Machinery, N.Y.," 1947/April/182.)

Plastic sealed thermostat in a lightweight electric comforter is a new development by Westinghouse Electric Corporation. Each thermostat is enclosed in a flexible plastic tube, heat sealed at both ends to the element wire, thus giving a completely waterproof enclosure. The warming sheet itself contains approximately 180 ft. of waterproof, plastic-insulated wire, sewn to muslin sheeting. ("Product Engineering," 1947/May/99.)

Refractive and reflective properties of acrylic resins are discussed by H. F. Pearson. In particular, the problem of "light piping" is dealt with, showing how to increase the attractiveness of products. ("Product Engineering," 1947/May/147.)

American plastics are surveyed by J. V. Sherman from point of view of supply position. Although the situation is improving, plant and basic material shortages still continue to restrict the available quantities of certain important resins. ("Materials and Methods," 1947/79/April.)

Bristles produced from casein are said to be particularly adapted for the construction of paint brushes. This is an important step forward, as these industries hitherto have had to rely on supplies from foreign sources, such as Russia, China, etc. The production process is described in detail. ("Chemical Engineering," 1947/March/108.)

Utility motor boat constructed of Fiberglas plastics is driven by 26 h.p. marine engine, but is still light enough to be lifted with one hand. Speeds in excess of 1 mile per hour per h.p. have been attained. ("Scientific American," 1947/May/222.)

Electric cables.—K. Zoehrer gives a survey of plastic materials which are useful for production of electric cables and conductors. Since this field of application is still in development, even greater successes than hitherto achieved may be expected from further researches. ("Kunststoffe," 1946/Sept./55.)

Nylon cable consisting of a 3-32-in. aero steel wire rope core of 920-lb. breaking strength covered with extruded Danco nylon, external diameters $\frac{3}{16}$ in. and 7-32 in., withstood 320,000 flexings over a 1-in. pulley before the steel core broke, and 410,000 flexings before the nylon severed ("Machine and Tool Blue Book," 1947/June/347.)

Phenoglaze, a phenol-formaldehyde protective coating manufactured in England, produces a plastic film impervious to heat, moisture and chemical action. ("Materials and Methods," 1947/May/141.)

Plastic dip coating, Tygoflex, is said to consist completely of solids and containing no volatiles such as water, thinners, solvents, reducers, etc. Applied by the usual techniques, a thick protective insulating layer is produced, resembling a glossy black rubber compound of medium hardness. ("Materials and Methods," 1947/May/144.)

Building Industries.—H. Saechtling reviews the manifold possibilities of plastics and similar products, and investigates critically the selection of suitable materials. ("Kunststoffe," 1946/**36**/97.)

Influence of temperature on impact strength and impact notch strength of laminated paper and textiles, using phenol resin as binder, has been investigated by C. Brinkmann. ("Kunststoffe," 1946/**36**/105.)

Plastic foils of macro-molecular material for the production of electric motors and apparatus are discussed by P. Nowak, under consideration of production and application, ("Kunststoffe," 1946/**36**/107.) The author gives recommendations for the correct application of the new materials, using the results of research as well as practical experience.

Rubber ring seals and their application in hydraulic mechanisms are discussed by D. R. Pearl in an illustrated research report. ("Machine Design," 1947/May/97.)

Glueing phenomena can be considered as chemical reactions and forces which are acting between the glue and the base, as well as between molecules of the glue itself. The formation of a glue by condensation of urea with formaldehyde (Melocol H) and its change of properties are discussed by K. Frey. (" Schweizer Archiv. für angew. Wissenschaft and Technik," 1947/**13**/83.)

Heat distortion tester for plastics, following ASTM recommendations, has been developed by American Instrument Co., Silver Spring, Md. The instrument comprises oil bath heated by a 2,000-watt immersion heater, centrifugal pump, cooling bath and synchronous motor-driven bimetallic thermo regulator, and control boxes. Four samples can be tested simultaneously. (" Instruments," 1947/May/428.)

Replaceable hammer tips in three grades of hardness are features of new Nupla hammer. The tips are stamped " soft," " medium " and " hard " for the convenience of the operator. Two tips can be used at the same time; they are fixed by a patented locking device. (" Machine and Tool Blue Book," 1947/June/290.)

Electronic sealing has been applied to transparent box manufacture by Eastman Kodak Co. Overlapping portions of the box end are firmly clamped between two electrodes, where the " deep-heat " fuses the two pieces of acetate in about 1.4 secs. (" Mechanical Engineering," 1947/June/501.)

Plastic " elastomers."—Th. A. Dickinson enumerates the desirable qualities, and shows that a mould can be finished in less than 3 hours. The production of plastic gauge handles is described in detail. (" Tool Engineer," 1947/May/38.)

Crazing of plastic dentures, according to research carried out by National Bureau of Standards, can be caused by use of tinfoil substitutes for lining the gypsum moulds. (" Nat. Bur. Standards, Technical News Bulletin," 1947/June/65). This investigation may be of interest in other applications where plastics are formed in plaster moulds, as in the small-scale production of novelties.

Fiberglas mat (T 36) as reinforcement in manufacture of laminated plastics products, and in production of flat plastic sheets, is announced by Owen-Corning Fiberglas Corporation. (" Materials and Methods," 1947/June/144.)

Qualities of plastics coating, rather than those of the base material, are, in many instances, responsible for the degree of service given by a product. Examples given by C. Breskin include corrosion preventive finishes for metals; oil and water resistant paper for packaging; sanitary finishes for kitchen, laboratory and hospital use. (" Scientific American," 1947/June/256.)

Plasticized thermoplastics are influenced decisively through the selection of the softeners employed. Results of co-operative research in the testing and investigation of softeners for nitrocellulose are summarized by P. Schmidt and K. Stockhert. (" Kunststoffe," 1947/**36**/59.)

Bakelized paper, the main product of Micafil, Ltd., is described in an illustrated article (" Micafil News," 1945.) Other products of this firm are acrylic glass and thermoplastic laminates.

SOURCES OF REFERENCE

We wish to remind readers that the sources of reference from which these pages are compiled are not, in general, retained in this office. We cannot, therefore, undertake to supply such originals. Nevertheless, most of the foreign journals referred to are available in the Patent Office Library (Southampton Buildings, Chancery Lane, W.C.2) and in the Science Library (South Kensington). Photo-duplicated copies of articles may be obtained from the Photostat Dept. of the Patent Office.

The Softening of Thermoplastic Sheet by Radiant Heat

Lamp type infra-red heating plants have for some time been used extensively in the plastics industry for softening thermoplastic materials before they are shaped by pressing or blowing, but there has hitherto been little published information on heating times or costs of the process. The present article provides data on these matters.

By L. J. C. Connell, B.Sc., A.Inst.P., and G. M. Hogarth*

LAMP plants for softening thermoplastic sheets, for instance "Perspex," usually take the form either of a pair of vertical banks of lamps and reflectors, between which the sheet can be suspended, or a single horizontal bank under which it can be supported. The mechanism of heating is the same in both cases. Radiation from the lamp filaments is directed by the reflectors on to the material, where absorption takes place and heat is generated. The temperature of the sheet then rises, and if left in the plant indefinitely would eventually become steady at a value at which the heat received by radiation balanced that lost by conduction, convection and re-radiation.

Acrylic sheet is appreciably transparent to the short wavelength radiation provided by lamp equipment. The full line in Fig. 1 shows the spectral distribution of the radiation emitted by the lamps; the broken line shows how this distribution is altered when the radiation emerges from a 1/10-in. sheet of clear, uncoloured material. The area under the full line is a measure of the total radiation from the lamps, and if reflection losses from the front surface are neglected, the area between the curves is a measure of the absorption. For this particular thickness of sheet about 40 per cent. of the radiation is absorbed. With greater thicknesses the proportion would be higher, the intensity of the transmitted radiation of any particular wavelength falling off exponentially with increase of thickness.

There has been some rather loose thinking in some discussions on the use of radiation for heating semi-transparent materials. It has been suggested that because certain wavelengths are incompletely absorbed by "Perspex" they cannot be used effectively for heating it, and it has been claimed that it is necessary instead to use longer wavelengths, to which the material is opaque. In practice this is not so, for the energy shown as transmitted in Fig. 1 is not wasted. If the sheet is heated between two banks of lamps and reflectors, multiple reflections

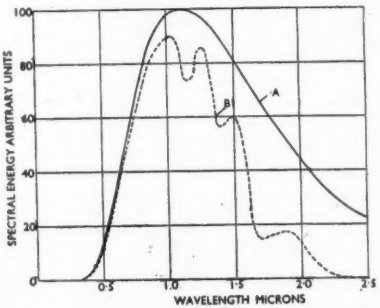


Fig. 1.—Curves showing (a) Spectral energy distribution of radiation emitted by infra-red industrial lamp (W. E. Forsythe, and E. Q. Adams, *J. Opt. Soc. Amer.*, 1945, 35, 108). (b) Distribution of proportion of it which is transmitted through 1/10 in. thick clear uncoloured acrylic sheet. (Based on transmission curve for methyl methacrylate polymer given by A. H. Pfund, *J. Opt. Soc. Amer.*, 1939, 29, 291.)

* Research Laboratories of the General Electric Co., Ltd., Wembley.

take place between them, with further absorption at each. If it is placed on a heat-insulating bed and irradiated from above, the transmitted radiation is partly reflected and partly absorbed by the bed, and the under surface of the sheet is heated by re-radiation and by conduction. The net effect of using short wavelength radiation is that absorption (and heating) occur not only at the surface *but also within the thickness of the material.* This makes for more uniform softening than would be obtained with longer wavelengths or by heating on a hot-plate or in an ordinary oven, because with all these methods the centre of the sheet would receive heat only by conduction from the surfaces.

Radiant heating has several advantages over oven methods. One of the most important is that it gives appreciably shorter softening times. It does this because heat can be transferred at a much greater rate by radiation than was possible in the ovens used in the past. The equipment is clean, and there is no risk of the "Perspex" becoming contaminated or marked, or of harmful fumes being produced. It can readily be made in portable form, so that units can be placed near the moulds or presses which they serve, and can be moved to suit changing production conditions. If necessary, plants can be made in such a way that two or three small units can be coupled together to deal with occasional larger sheets. A further advantage is that the pre-heating period which had to be allowed to enable ovens to reach their operating temperature may be dispensed with, as lamp plants can be used immediately they are switched on. Automatically controlled heating cycles can readily be provided. It is also possible to combine the features of rapid pre-heating and accurate control of the temperature of the heated sheet at a pre-set figure for an indefinite period.

Figs. 2 and 3 give general views of typical production installations which are being used in the manufacture of articles varying in size from small decorative bowls to wash basins.

Care is necessary in selecting a method for measuring the temperature of "Perspex" whilst it is being irradiated. The difficulty arises from the necessity for avoiding distortion of the readings by absorption of radiation in the measuring device. Mercury or alcohol thermometers placed in the plant are, of course, useless for the purpose. The measurements described in this section were all made with a fine-gauge copper-Constantan thermo-junction (wire diameter 0.004 in.). In the case of sheets $\frac{1}{8}$ in. thick and over, the junction was located at the centre of a hole 1 in. long and 0.035 in. in diameter, which was drilled across the corner of the sheet parallel to and equidistant from the surfaces. For the $\frac{1}{16}$-in. sheet the junction was inserted in a narrow saw-cut across the corner.

Temperature Measurement

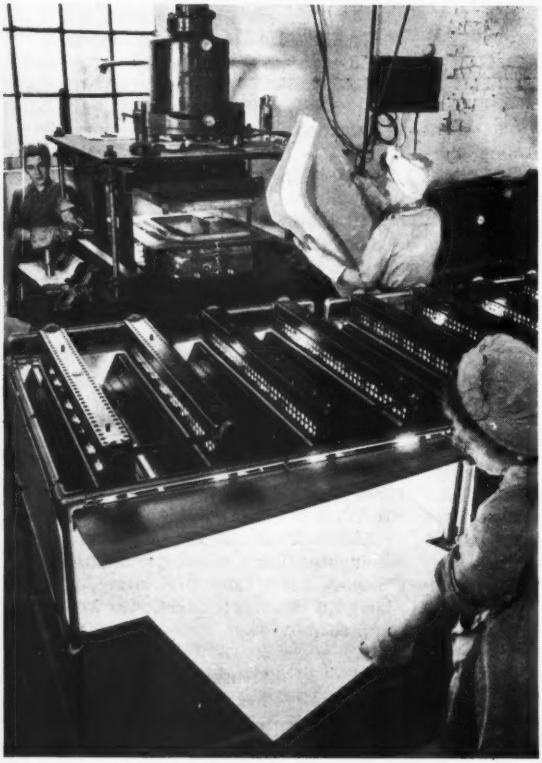
The measurements were made with 12-in. square samples of "Perspex" (mostly with clear, uncoloured material) of nominal thicknesses $\frac{1}{16}$, $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$ and $\frac{1}{2}$ in., and with two types of plant:—

(a) One horizontal bank of three 3-ft. by 10¾-in. trough reflectors, mounted with their mouths 11 ins. above a bed formed of two $\frac{3}{16}$-in. sheets of asbestos millboard covered by a sheet of cream-coloured cotton fabric.

(b) Two vertical banks, each of three 3-ft. by 10¾-in. trough reflectors, mounted 20 ins. apart.

Each trough was fitted with rhodium-plated reflectors and contained nine 250-watt 115-volt infra-red industrial lamps (i.e., the loadings of the two plants were 6.75 kW and 13.5 kW respectively). The sides of both plants and the top and bottom of plant (b) were covered in with polished stainless steel sheets to reduce radiation losses and to prevent cooling by draughts. These sheets are important, as without them rates of heating, particularly in draughty situations, would be appreciably lower.

As a check on the accuracy of the method of measuring temperatures, some preliminary heating and cooling tests were made with $\frac{1}{4}$-in. sheet. No discontinuity could be detected in the cool-



Figs. 2 and 3.—General views of lamp-type infra-red heating as installed in a large moulding shop for articles ranging in size from small decorative bowls to wash-basins. (Photographs by courtesy of Grantham Plastics Ltd.)

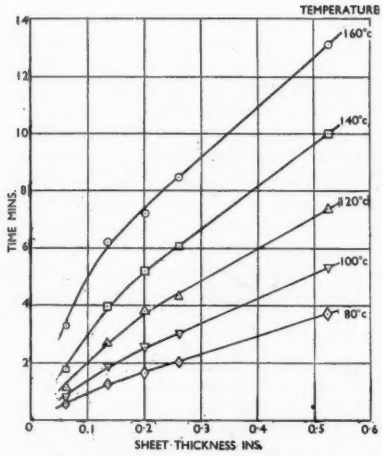


Fig. 4.—Heating times for clear uncoloured "Perspex" in pre-heated horizontal plant.

ing curve during the period immediately after the lamps had been switched off and it was concluded that the thermo-junction had been in thermal equilibrium with the walls of the hole. It is important to guard against the hole becoming discoloured by grease or dirt during drilling. By deliberately painting the walls black, readings may be increased by 15-20 degrees C.

Although lamp plants become effective immediately they are switched on, some building up of heating intensity takes place during the first few minutes. For example, it is clear that when a plant of type (a) is in continuous use, the bed will become heated and will contribute towards the heating of the thermoplastic sheet. The softening times, which are usually of interest for production purposes, are those applying in the hot plant. With sheets of all thicknesses, a 10-minute pre-heating period before the insertion of the sheet raises the bed temperature to the figure it attains during constant use (i.e., by the time a sheet of cold "Perspex" placed in a plant pre-heated in this way reaches moulding temperature, the bed temperature, after its initial fall, recovers again to within five degrees C. of its value at the time the sheet was inserted). A standard pre-heating time of 10 mins. was used with the vertical as well as the horizontal plant, in order to allow the reflectors (which emit secondary radiation) and the air in the plant to heat up.

The results of the measurements are presented in the form of graphs showing the time taken by sheets of clear uncoloured material of various thicknesses to reach specified temperatures. Figs. 4 and 5 give curves for horizontal and vertical plants respectively. They have been corrected to correspond with an ambient air temperature of 15 degrees C.

Comparative measurements with the plant cold initially, showed that the times taken to reach temperatures of 120, 140 and 160 degrees C. are 3.0, 4.0 and 5.7 mins. longer respectively in the horizontal plant and 1.0, 1.4 and 1.9 mins. longer in the vertical plant. These figures apply within ±0.2 mins. for sheet thicknesses varying from $\frac{1}{8}$-in. to $\frac{1}{2}$-in.

As a guide to the condition of the sheet at different temperatures, it may be noted that at about 80 degrees C., plasticized $\frac{1}{4}$-in. sheet is just soft enough to be bent with the fingers and that in the range 130-150 degrees C. it is quite flexible and rubbery.

Unplasticized material softens at about 110 degrees C. and can be moulded readily at 130-150 degrees C. Overheating causes small bubbles to develop internally. The minimum temperatures

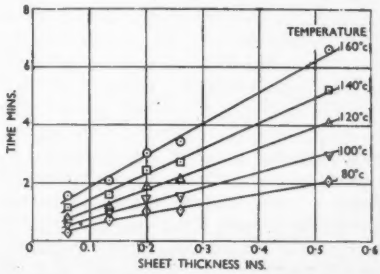


Fig. 5.—Heating times for clear uncoloured "Perspex" in pre-heated vertical plant.

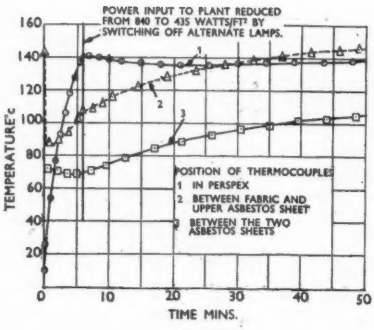

POWER INPUT TO PLANT REDUCED FROM 840 TO 435 WATTS/FT² BY SWITCHING OFF ALTERNATE LAMPS.
TEMPERATURE °C
TIME MINS.
POSITION OF THERMOCOUPLE
1 IN PERSPEX
2 BETWEEN FABRIC AND UPPER ASBESTOS SHEET
3 BETWEEN THE TWO ASBESTOS SHEETS

Fig. 6.—Curves illustrating temperature control obtainable by reducing power input after initial heating period. ($\frac{1}{4}$ in. clear uncoloured "Perspex" heated in horizontal plant.)

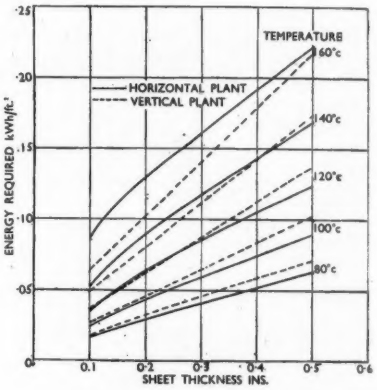


Fig. 7.—Energy consumed in heating sheets of clear uncoloured "Perspex" in pre-heated horizontal and vertical plants.

at which this is found to occur is 165-170 degrees C., but in several instances sheets heated to higher temperatures for short times showed no apparent deterioration.

Coloured materials are heated slightly more rapidly than uncoloured. Measurements in a pre-heated horizontal plant with $\frac{1}{4}$-in. opal, clear and opaque red, and opaque blue sheets showed that there is little to choose between the heating rates of these materials. At any given heating time in excess of two minutes they all reach temperatures 15-25 degrees C. higher than the clear uncoloured material.

Temperature Control

It is sometimes desirable to combine rapid initial heating and close control of final temperature. This can readily be done with the aid of a process timer circuit, which can be adjusted so that at the end of a pre-set period, the intensity is automatically reduced by switching out some of the lamps or by operating them through a transformer from a lower voltage supply. Alternatively, the process timer may be made to bring into circuit an energy regulator which switches the lamps on and off continuously in accordance with a pre-set ratio of "on" to "off" time. This limits the upper temperature and allows the sheet to be left in the plant indefinitely without overheating. It is thus of advantage where the press or moulding time is apt to be erratic.

The lamp filament is an ideal source for these methods as its small mass enables it to cool very rapidly when switched off, thus giving an immediate reduction in intensity, and a resulting close accuracy of temperature control of the plastic sheet.

Fig. 6 illustrates the control obtainable by switching out alternative lamps. It is interesting to note that although the thermoplastic sheet is being irradiated

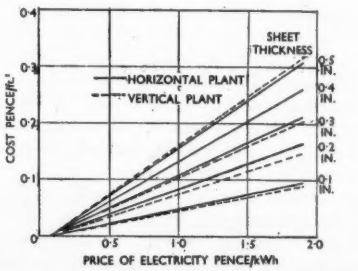


Fig. 8.—Cost of heating clear uncoloured "Perspex" sheet to 140°C.

from above, it eventually reaches a steady temperature which is lower than that of the thermo-junction under the fabric beneath it. The explanation of this is that heat is generated at the upper surface of the fabric because of the transparency of the thermoplastic and that as the heat loss from the fabric-thermoplastic system takes place chiefly from the upper surface of the plastic there is a corresponding temperature gradient through the air space at the fabric—plastic interface and also through the plastic itself.

Operating Costs

Operating costs can be calculated from the curves in Figs. 4 and 5, but for convenience Figs. 7 and 8 have been prepared so that they can be read off directly. Both apply to clear uncoloured material. Fig. 7 shows the energy consumption in kW/ft.^{2} to heat sheets of various thicknesses to temperatures in the range 80-160 degrees C. Fig. 8 shows the total costs (inclusive of current and lamp replacement costs) in pence/ft^2 to heat various specified thicknesses of sheet to 140 degrees C. with electricity prices of up to 2d. per kW. It is assumed in both cases that the sheet covers 80 per cent. of the plant area. It will be noted that there is little to choose between the cost of softening in vertical and horizontal plants. If the sheet must be maintained at a steady temperature for some time after softening, the horizontal plant is usually the more economical as the energy to be supplied must be sufficient to compensate for the heat losses, which are greater for a sheet suspended with both surfaces exposed than for one resting on a bed of heat insulating material.

Although this article deals mainly with the softening of "Perspex," it will not be out of place to mention that the same equipment is used for heating other thermoplastic materials. Thus cellulose acetate may be softened in much the same manner, and plants are in use for heating it in sheet form prior to punching out or forming such articles as spectacle frames, buckles and lamp shades. The heating times approximate closely to those for "Perspex." It is common practice to use cellulose acetate in thinner sheets than "Perspex," and the softening times for materials 0.03-0.04 in. thick, heated from one side, are 30-45 seconds.

There are also applications in the treatment of polyvinyl chloride, for example, in heating the material in strip form or as granules prior to feeding it into a calender or extruder, in heating calendered sheet or p.v.c.-coated fabric prior to embossing, and in heating coatings of p.v.c. paste on fabric or other materials to promote gelation.

COMBINED OPTICAL INDUSTRIES, LTD.

On July 9 a party of members of the Plastics Institute paid a visit to this company's works at Slough, where the production of plastic lenses from "Perspex" sheet was described. While the processing methods have been known in general terms to most technologists it was most interesting to follow the production of high precision moulds polished to an optical accuracy and to see at close quarters the method of surface-hardening of such lenses. This comprises the immersion of a "cage" holding a number of lenses into a vessel where it is submitted to the vapour of a silicon compound. The lenses are thus coated with an extremely thin transparent film of silica which renders them resistant to normal rubbing.

AWARD OF TRAINING GRANTS

The Selection Committee of the Plastics Institute has interviewed 16 candidates for training grants of £100 for one year's intensive study. The candidates, who are engaged in the plastics industry, came from all parts of Great Britain. The awards made were as follows:—K. B. Arthur (I.C.I., Ltd., Plastics Division), M. H. Smith (BX Plastics, Ltd., Essex), J. F. A. Williams (I.C.I., Ltd., Plastics Division), A. P. Keogh (Enfield Cables, Ltd.), R. Pilmer (North British Rubber Co., Ltd.), W. R. O'Connell (BX Plastics, Ltd., Essex), J. L. Tring (I.C.I., Ltd., Plastics Division), J. C. Knappe (I.C.I., Ltd., Plastics Division), J. B. Askew (B.I.P., Ltd., Oldbury), N. Moss (Cascelloid, Ltd., Leicester).

Plastics at the International Congress of Pure and Applied Chemistry

ABOUT 2,000 chemists attended the 11th International Congress of Pure and Applied Chemistry, held in London, July 17 to 24. The official delegates from 28 countries numbered nearly 400. The countries most strongly represented, apart from Britain and the British Commonwealth, were France, Italy, Holland and the United States.

Section 11, covering chemistry in relation to elastomers and plastics (also glass and ceramics), was under the presidency of Professor O. Dony-Henault, who was professor of electro-chemistry and of industrial chemistry at Mons, 1904-30, and held a similar position at the University of Brussels, 1919-43.

Papers of plastics interest in Section 11 were as follows:—

A dynamic model of crystallization and plastic flow (Sir Lawrence Bragg).

Elastomers, plastics, glass and ceramics surveyed from an electrical standpoint (Dr. L. Hartshorn).

Plastics progress, 1939-47 (N. N. T. Samaras and F. R. J. Schatz).

Structure of elastomers—a critical review (Dr. E. A. Hauser and Mr. Le Beau).

Intrinsic viscosity, diffusion and sedimentation rate of polymers in solution (Dr. P. Debye).

Relation between intrinsic viscosity and molecular weight in polymer solutions (Dr. A. Goldberg and Prof. H. Mark).

Intrinsic viscosity—molecular weight relationship in polymer solutions (W. J. Badgeley, Dr. A. Goldberg and Prof. H. Mark).

Aspects of surface film technique in polymer research (Dr. D. J. Crisp).

Control of plasticity of natural rubber by chemical agents (M. W. Philpott).

Plasticizer action and chemical constitution (Dr. D. Faulkner).

Dissolving swelling and plasticizing of polymers (Dr. R. Houwink).

Rate processes and equilibria involving high polymers (Prof. R. M. Barrer).

Friedel-Crafts catalysts in polymerization (Prof. R. G. W. Norrish).

Rheological properties of systems containing high concentration of dispersed particles (Dr. J. S. Gourlay).

Crystallization of high polymers and its effect on mechanical properties (Dr. G. Gee).

Review of polycondensation rubbers (Dr. W. J. S. Naunton, R. J. W. Reynolds, D. A. Harper and Dr. E. E. Walker).

Reactions between rubber and unsaturated compounds (Dr. Le Bras and Dr. Delalande).

Autoxidation of rubber and mechanism of antioxidant action (Dr. W. C. Davey and Mr. Kendall).

Redox acceleration of emulsion polymerization (Dr. W. L. Semon).

Mechanical properties of plastics (W. Lethersich).

Some aspects of plastics (Prof. H. von Euler).

Application of statistical theory of gelation and cross-linking to reaction between phenol alcohols and certain polymerized oils (Dr. H. S. Lilley and Dr. J. Osmond).

Possibility of hydroxyl reaction in phenolic resin formation (Dr. C. A. Redfarn).

Cold-setting adhesives prepared from formaldehyde and various phenols (Dr. G. E. Little and Dr. K. W. Pepper).

Modern trends in application of plastics (Dr. V. E. Yarsley).

Chemistry of leather-resinoid as a new plastics material (Dr. A. Colin-Russ).

A joint symposium of Section 2 (physical chemistry) with Sections 10 and 11 included the following papers concerning polymers:—

Synthesis and properties of highly branched super ester molecules (H. W. Melville).

Cross-linking and polymerization reactions in keratin (J. B. Speakman).

Mechanism of co-polymerization (T. Alfrey and H. Mark).

Polymer constitution and fibre properties (R. Hill and R. H. Davies).

Size and configuration of polymer molecules in solution (P. M. Doty, S. Signer and H. Mark).

Application of infra-red methods to study of polymers (G. B. B. M. Sutherland).

Study of polymers and macromolecules by infra-red spectroscopy (H. W. Thompson).

Abstracts of some of these papers which are of particular interest to the plastics industry are given below.

Plasticizer Action and Chemical Constitution

(D. Faulkner)

This investigation had as its object the determination of the influence of plasticizer constitution on the plasticization of polyvinyl chloride. It embraced the study of several methods of assessing plasticizer efficiency, viz., the use of intrinsic viscosity value as an expression of solvent power, determination of equilibrium swelling, determination of the precipitability of polymer solutions, and plots of the load-extension characteristics of plasticized compositions.

The plasticizers used comprised (a) esters of constant molecular weight derived from aliphatic dibasic acids; (b) esters of phthalic acid.

With the first series, there was satisfactory qualitative correlation between the results given by the above methods, a maximum in the values of solvent power being observed. Chain-branching in the plasticizer molecule reduced the solvent power.

With the second series, correlation between the four methods was less satisfactory. The viscosity and swelling methods gave slightly different positions of maximum solvent power, whilst the mechanical tests could not be interpreted on the basis of solvent power alone.

The author discussed the application of certain thermodynamic relations to the results obtained in swelling measurements.

Hydroxyl Reaction in Phenolic Resin Formation

(Dr. C. A. Redfarn)

The author of this paper gave a résumé of the theories of Baekeland and others on the structure of hardened one-stage phenol-formaldehyde resins ("resites"), indicating how the early structural theories postulated reaction of the phenolic hydroxyl groups to give ether linkages; later investigators (Koebner, Megson, Weith) tended to the view that phenols are reactive towards formaldehyde only in the o, o′ and p-positions. This view, coupled with the functionality theory, predicts that phenol, m-cresol, 1:3:5-xylenol and resorcinol give thermoset resins, and o-cresol, p-cresol, 1:2:5-xylenol, 1:3:4-xylenol and 1:2:3-xylenol give permanently thermoplastic resins.

The production of thermoset resins from o-cresol, p-cresol, p-chloroxylenol and hemimellitenol are reported. From this and the reported failure of diagomethane to methylate resite, it is suggested that in some unspecified manner the phenolic hydroxyl group enters into the cross-linking reaction in "resite" formation. A very brief published reference has been found on the possibility of hydrogen bonding in phenolic resins.

Crystallization of High Polymers and Effect on Mechanical Properties

(Geoffrey Gee)

Polymers differ from substances of low molecular weight in that they are never wholly crystalline. Crystallization of a polymer consists in the fitting together into a regular lattice of portions of adjacent molecules, leaving inevitably some regions which are unable to achieve the necessary order. The ratio of crystalline to amorphous in a polymer is thus likely to depend not only on the external conditions but also on the history of the particular specimen considered. The concept of an equilibrium between two phases is of very limited value.

The author discussed the thermodynamic description of the system, and gave a physical interpretation of the melting range of a polymer and its dependence on the conditions of crystallization.

It is now widely accepted that the tensile strength of an elastic polymer is closely related to its ability to crystallize. The hypothesis is advanced that the tensile strengths of a series of chemically similar polymers are determined by the extent to which they crystallize before breaking. Experimental data are recorded for a series of vulcanized natural

rubbers. Systematic variations were made in the degree of cross linking, using several types of compound.

The effect of swelling samples to varying extents in mineral oil has also been studied. No quantitative estimate has been made of the extents of crystallization obtained, but the results are in qualitative agreement with hypothesis.

Dissolving, Swelling and Plasticizing of Polymers

(R. Houwink, of Delft, Holland)

This paper discussed the differences between internal and external plasticizing. Softening is considered to be a more adequate expression than plasticizing, since it also covers the phenomena of elasticizing. For external softening it is necessary that the softener enters into the polymer, leading to swelling.

The laws controlling the conditions for swelling are similar to those controlling the phenomena of dissolving and of permeation. The final result is depending on the changes of free energy and thus on the magnitudes of the entropy increase possible, in relation with the changes in internal energy.

Two types of swelling are to be distinguished, i.e., limited and unlimited. The limited swelling observed in practice is not only depending on the possibilities of interlinking, but also on the combinations of intermocular forces involved. For studying limited swelling, these qualities should be calculated per monomer group and not as an integral quantity for the material bulk.

Influence of pH on Setting Time of Phenol-formaldehyde Resins

(Dr. G. E. Little and Dr. K. W. Pepper)

Difficulties are experienced in the handling of cold-setting phenol-formaldehyde resin glues which require a strong acid as hardener. An investigation has been made into the dependence of setting on pH with the objective of developing glues setting under milder conditions.

The setting of resins based on monohydric phenols is controlled by hydrogen ion concentration. For each phenol there is a "barrier pH" above which setting is protracted. For phenol and its ortho derivatives the barrier pH is about unity. Higher values are given by m-cresol and m-5-xylenol, but this improvement is offset by greater sensitivity to hardener concentration. The method of preparation is of minor importance. It is concluded that resins setting under neutral or mildly acid conditions cannot be prepared from monohydric phenols alone.

Resins from polyhydric phenols also set at low pH values under the influence of hydrogen ion, but where the phenol has a 1:3 structure, setting also occurs at higher pH at a rate dependent on hydroxyl ion concentration. The resorcinol-formaldehyde condensation has been examined, and a glue has been developed which overcomes the disadvantages of the phenol-based glues.

The author presented evidence which indicates that in the presence of either hydrogen ion or hydroxyl ion setting may be represented by the scheme: Phenol—phenolic alcohol—phenol—di-substituted methane.

Surface Film Technique in Polymer Research

(Dr. D. Crisp)

The behaviour of different polymer when spread at interfaces indicates that polar forces, probably of dipole-dipole repulsion, play the predominant part in creating a surface pressure. Only polymers containing water attracting groups will spread quantitatively.

As a rapid analytical method for measuring concentration, the Langmuir trough technique is particularly suitable for dilute solutions of polymers. The method may also be employed to determine the composition of a copolymer of partial hydrosylate. Polymers containing different proportions of the two types of residue give force area curves characteristic of their composition, but independent of the molecular weight, provided that this is not too low. The partial hydrosylate of polyvinyl acetate and the copolymerized butadiene-acrylonitrile are cited as examples.

This approach may be extended to the investigation of polymers of doubtful structure, e.g., to determine the cross-linkage or chain branching. The shape of the force-area curve may also give an indication as to the successive positioning of different groups in the chain.

Measurement of surface potential gives useful information on the presence of configuration of the polar groups, but more requires to be learned of the interaction of polar groups at interfaces.

Chemistry of "Leather-Resinoid" as New Plastics Material (Dr. A. Colin-Russ)

"Leather-resinoid" is a generic term for a partially hydrolysed non-porous form of vegetable or chrome-tanned collagen protein, or of both tannages combined; it may be, also, a condensation product if aldehyde is allowed to react with it after partial-hydrolysis.

Unlike leather of any selected tannage, the corresponding simplest (uncondensed) resinoid form is easily solubilized without decomposition; e.g., so-called leather-resinoid B is derived from vegetable tanned leather and although both are insoluble in water, only the former can be dissolved in mono- or di-ethylene glycol or amides without decomposition. The chemical reactivity of leather, whatever its tannage, is thus greatly enhanced by conversion to its resinoid form, and a vastly greater range of compounds offered for exploration.

The condensation with aldehyde is analysed into four co-existing stages in which Bakelite types of reaction occur together with complex co-ordination with chromium in olated form.

Since the polypeptide structure of leather-protein is rather bridged, and cross-linking is not lessened by partial hydrolysis if the latter is followed by aldehyde treatment, the author confines his discussion more profitably to the colloidal viewpoint and elaborates the feature of stepwise solvation. The position of leather-resinoid material was indicated in relation to rubber and well-established plastics.

Phlobaphenes, New Types of Plasticizers (Prof. H. von Euler)

In 1844, Stähelin and Hofstetter obtained, by extraction of bark, a wax-like crude material which they called phlobaphene; since that date the term phlobaphene is used in plant biochemistry for this still undefined class of substances. Recently phlobaphenes, prepared by pyrolysis of pine bark (Euler and Hasselqist) have been fractionated and purified. By various analytical methods, several of these phlobaphenes could be recognized as catechol esters of different saturated and non-saturated aliphatic acids, containing 16 to 22 C-atoms.

By comparison with synthetic products, prepared by esterification of catechol with the chlorides of fatty acids, the structure of natural phlobaphenes, e.g., the catechol ester of arachidic acid, $C_{26}H_{46}O_2$, could be determined; in addition the chemical and physical properties of these esters, especially the velocity of their saponification, could be studied.

On account of their behaviour in solvents and because of their melting points, viscosity and physical properties, phlobaphenes can be used as softening agents in the plastics industry. They are very suitable to replace, in many cases, not only plasticizers derived from castor oil and alkyd products, but also the phthalic acid derivatives.

Phlobaphenes can be manufactured in a large scale from bark, the utilization of which is an actual industrial problem. The possibility of utilizing bark products in this way appears so much more important, when it is considered that the need for plasticizers, which are used in quantities up to 30 per cent. of synthetic resins, is a very real one.

Phlobaphenes (catechol mono-esters) also combine with formaldehyde, giving phenolalcohols. Generally plasticizing phlobaphenes act as local solvents. When added to Bakelite resins at higher temperatures, phlobaphenes and several of their derivatives seem to enter into local chemical reactions with resin molecules.

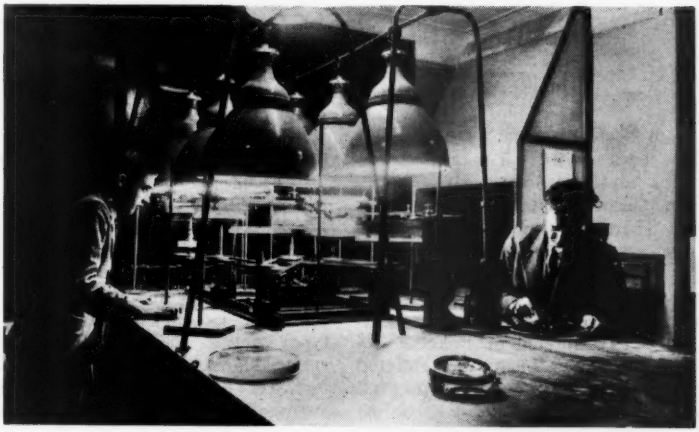
11TH INTERNATIONAL CONGRESS

Visit I.C.I., Plastics Division, at Welwyn Garden City

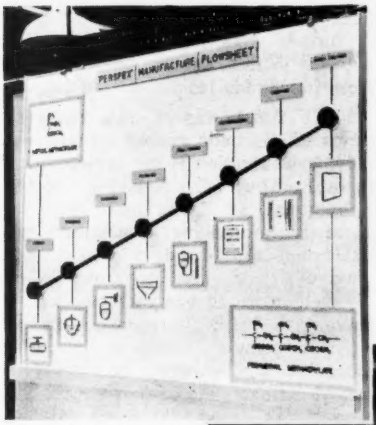
(Above) Some of the guests "in the Paddock."

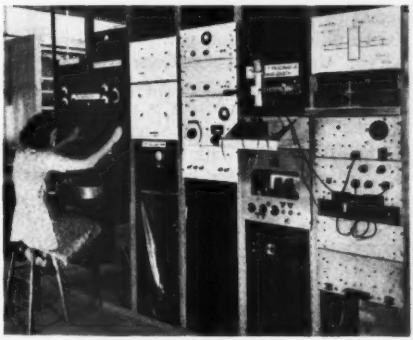
(Above) Sir Wallace Akers reads a message from Lord McGowan. On extreme right (looking towards speaker), Mr. Charles Waghorne.

"Whatever next?" (left to right) Mr. J. C. Swallow (holding brush), Mr. H. V. Potter, Dr. W. Cullen, Mr. Dumpleton (M.P. for St. Albans), and Dr. Lessing.

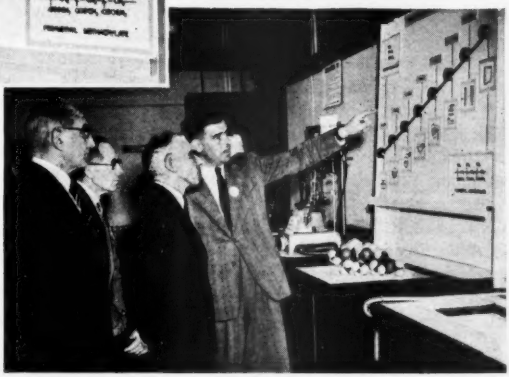


Light polymerization of methyl methacrylate for production of lenses.





(Above) Electrical testing equipment.



(Right) Mr. J. C. Swallow describes the manufacture of "Perspex" to Mr. Dumpleton by aid of the flow sheet (reproduced above).

PLASTICS IN GERMANY

The New Target in Germany is the Science behind the Industries. The following are additional Notes from the Official Reports which can be obtained from H.M. Stationery Office

FIAT Final Report, No. 389.—Veneer and plywood manufacturing technique and machinery observed in Western Germany are covered in this report. There is a brief section dealing with the application of liquid phenolic glues. During the war much plywood gluing was done, using very thin veneers. Apparently the liquid phenolic resins used, such as Imprenal or Bakelite 299 (formerly known as Resinit 240) differed greatly in viscosity and solid content, and the differences in glue spreads obtained were so great that, with certain thicknesses of veneer, the specific gravities of the resulting plywood panels did not fall within aircraft specifications (not over 1,100 kg. per cu. m.). According to German investigations, it is necessary to apply enough glue for the weight of the resin solids to amount to 32.5 grams per sq. m. (6½ lb. per 1,000 sq. ft.) in the case of veneers 0.75 mm. (0.3 inch) thick. Veneers of twice this thickness need 55 grams resin solids per sq. m. (12 lb. per 1,000 sq. ft.) to obtain optimum specific gravities required by aircraft specifications.

FIAT Final Report, No. 464.—This survey of the German coated fabrics industry covers oilcloth, nitrocellulose coated fabrics, p.v.c. coated fabrics and films, and miscellaneous coating materials. The use of plasticized p.v.c. resins during the war was general in the coated fabric industry throughout Germany. The resins first came into general use about 1938. The principal producer of the polymer was the I.G. plant at Bitterfeld. In contrast to the direction of development in the United States, the Germans made inside use of the paste dispersion method of application wherein resin, plasticizer and pigments are merely mixed together and applied to the cloth as a paste containing 100 per cent. solids, subsequent fuzing under high heat giving a tough flexible film or coating for the fabric. Lightweight coatings had 2 to 2½ oz. per sq. yd.; standard coatings for upholstery and leather goods, 8 to 12 oz. per sq. yd.; shoe soling material, a thickness of 3 to 4 mm. The preparation of the pastes was extremely simple, various types of mixing equipment being practical. Coating was done on standard type coating machines, fitted with a rubber blanket. Passage through the hot box, at 110-130 degrees C., was at an average speed of 4 to 6 m. per minute. The usual fuzing time of 4 oz. of coating per sq. yd. was 2 to 3 minutes at 160 degrees C.; subjecting the cloth backing to this temperature did not materially affect the tensile strength of the fabric. A further section of this report deals with the manufacture of artificial leather from polyamide resins.

FIAT Final Report, No. 618.—The status of synthetic rubber research and polymer evaluation is the subject of this report. The I.G. Synthetic Rubber Laboratory at Leverkusen was unsuccessful in making co-polymers with butadiene from vinyl chloride, methyl vinyl ether, or vinyl carbazole. Vinylidene chloride and benzalacetone will co-polymerize with butadiene, but the polymers show no interesting properties. Extensive studies were conducted on methyl methacrylate co-polymers, but no product as good as Buna S3 was developed. Buna M (methyl methacrylate co-polymer) showed better processability than either Buna S or S3, but worse welding characteristics after cure.

FIAT Final Report, No. 646.—This report is a detailed study of the process employed for the manufacture of films from linear polyamides. The product was used in the form of sheets for the protection of armed personnel from

(Continued on page 450.)

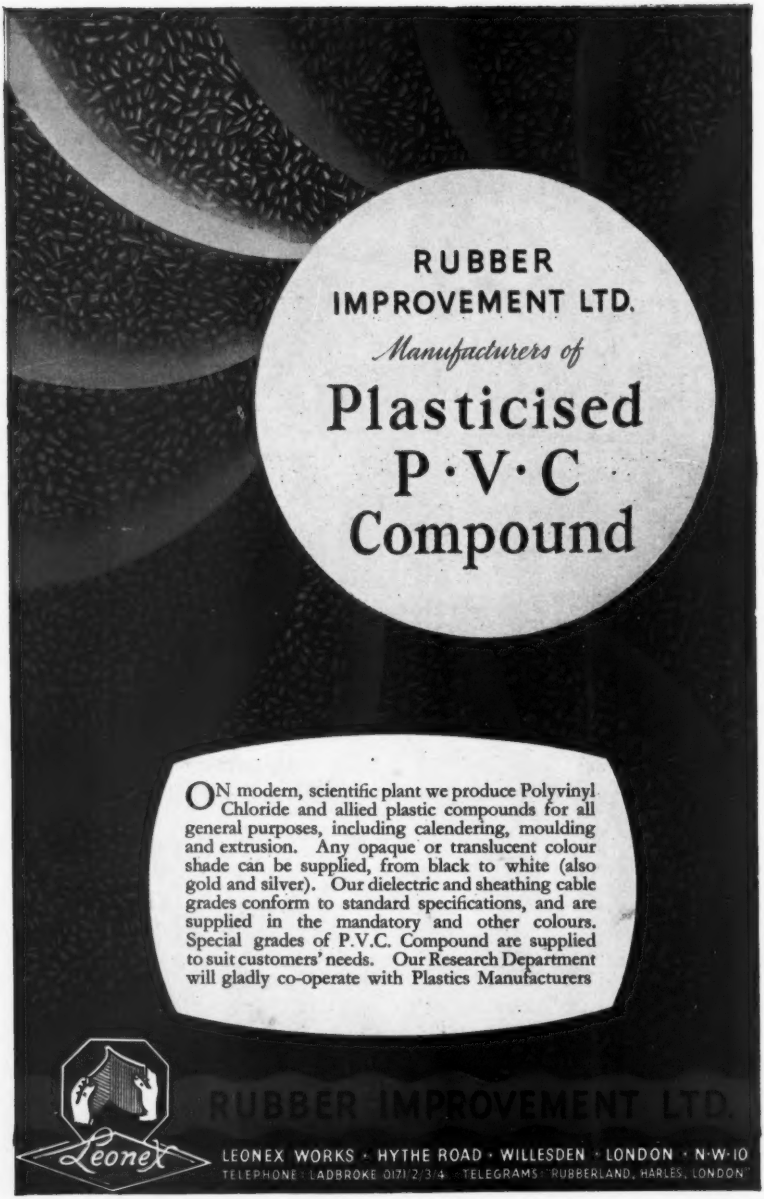
BRIGHT NEWS FOR A DRAB WORLD (OF SHORTAGES)

At last! Monsanto's LUSTRON—the new and improved polystyrene moulding compound—is now being delivered in quantity from stock. With faster moulding properties, LUSTRON — the no-waste, low-priced moulding material of the future is here today; to give colourful, jewel-like beauty and added sales appeal to your products. Write for full information on how you can profit by LUSTRON to Plastics Sales Department, Monsanto Chemicals Limited, Victoria Station House, London, S.W.1.

QUICK FACTS ABOUT LUSTRON

1. Immediate delivery
2. Low cost per pound
3. Light weight
4. Faster moulding
5. Gay colour range
6. New brilliance and clarity
7. No taste or odour
8. Excellent chemical resistance
9. High dimensional stability
10. Excellent electrical qualities

MONSANTO CHEMICALS


RUBBER
IMPROVEMENT LTD.
Manufacturers of
Plasticised
P·V·C
Compound
ON modern, scientific plant we produce Polyvinyl Chloride and allied plastic compounds for all general purposes, including calendering, moulding and extrusion. Any opaque or translucent colour shade can be supplied, from black to white (also gold and silver). Our dielectric and sheathing cable grades conform to standard specifications, and are supplied in the mandatory and other colours. Special grades of P.V.C. Compound are supplied to suit customers' needs. Our Research Department will gladly co-operate with Plastics Manufacturers
Leonex
RUBBER IMPROVEMENT LTD.
LEONEX WORKS · HYTHE ROAD · WILLESDEN · LONDON · N·W·10
TELEPHONE: LADBROKE 0171/2/3/4 · TELEGRAMS: "RUBBERLAND, HARLES, LONDON"

Cellulose Acetate Plastics

III.—Manufacture of Cellulose Acetate

By
Vivian Stannett

CELLULOSE is one of the commonest of all organic materials found in nature and has been estimated as making up nearly one-third of the substance of the world's vegetation. However, sources of a suitable grade for conversion to cellulose acetate are rather limited. Impure types lead to brown or yellowish grades of acetate of poor clarity, due among other causes to charring of the impurities by the acetylation mixtures. The purest naturally occurring cellulose found in bulk is cotton fibre; this has an initial purity which renders elaborate processes of purification to the so-called chemical cellulose unnecessary.

The long, whitish cotton seed fibres are taken for direct use in textiles, but after these are removed, shorter and darker coloured fibres still remain on the seed. These short fibres are known as cotton linters and are unsuitable for textile uses, but are ideal for chemical conversion into acetate and other cellulose derivatives. The scarcity and high price of cotton linters, together with their being restricted to countries with a suitable climate for the cultivation of the cotton plant, has led to a determined search being made for other suitable sources.

Unfortunately, the lengthy methods of extraction and purification of cellulose from other sources, lead to an expensive and often degraded product of poorer quality. Nevertheless, some success in this direction has been achieved, and German cellulose acetate was almost exclusively prepared from woodpulp cellulose during the war; it is doubtful whether this would be an economical proposition under normal circumstances, however. Most German technicians appeared to agree that cotton linters gave a far more suitable cellulose for acetylation, and in normal times were far cheaper than the highly purified woodpulp cellulose.

Many other sources of cellulose have also been investigated, but so far without any marked success. A list of commonly occurring materials with their cellulose content is given in Table 1; this shows the potentially huge supplies which are available to the industry, once satisfactory methods of extraction and preparation of the cellulose are found. Many other straws, grasses, and such things as potato vines, also present an attractive proposition, if their high cellulose content can be economically exploited.

At the present time, however, it can safely be said that the bulk of the world's cellulose acetate is produced from cotton linters with woodpulp as the only other established source. A brief description will now be given of the preparation of pure cellulose, suitable for conversion to acetate from these two major sources.

Cotton Linters

After the long lint fibres have been cut from the cotton seed by the ginning process, the shorter fuzz fibres remain. These are then removed from the seed by special de-linting machines, which consist of a system of revolving circular saws, similar to the ginning machines, only more closely set. The fuzz fibres thus removed are usually known to-day

Table I.—Cellulose Content of Common Vegetable Materials

(Summarized from various sources)

Wood	50 – 60%
Cotton linters	85 – 90%
Flax	88 – 92%
Jute	60 – 70%
Ramie	85%
Hemp	78%
Cereal straws	40 – 50%
Kapok fibre	55 – 65%
Bagasse	60%

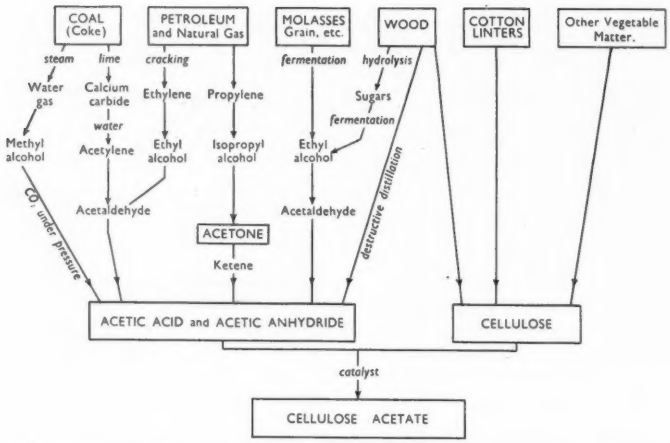


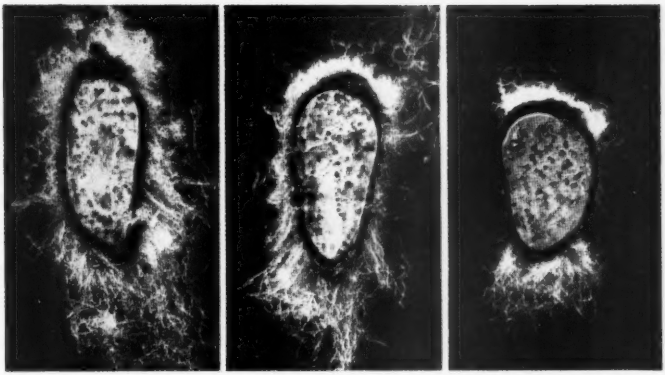
Fig. 1.—Simplified scheme showing some of the actual and potential raw material sources for cellulose acetate.

as cotton linters. They can be removed as three different grades; either the bulk are removed by a single cut, this type being known in the trade as "mill runs" or two separate cuts are taken from the seeds.

The first-cut linters are the longest and are usually absorbed by the textile trade, for use in low-grade yarns, etc. The second cut is almost entirely used for conversion into chemical cellulose, from which the various cellulose derivatives are prepared, including cellulose acetate. The single mill run grade is used partly as a stuffing medium for cushions, mattresses and so on, and partly for conversion to chemical cellulose, according to the demand and quality. Owing to the heavy demand for chemical cellulose, a fourth grade of linters is sometimes extracted by grinding the hulls from the cotton seed after the other grades of linters have been removed. These are of very short fibre length and a special technique in handling them is necessary.

The purity of the cotton linters varies from batch to batch, but an average analysis has been given as cellulose 80-85 per cent, lignin 3 per cent., ether soluble matter (fats, etc.) 1 per cent., ash 1-1.5 per cent., and moisture 6 per cent. It can be seen from these figures that further purification is necessary before a "chemically pure" grade of cellulose can be claimed. This purification is carried out in a series of operations.

The linters are first separated from any heavy impurities by treatment with a stream of air in such a way that any heavy particles fall away from the linters. The next stage in the purification process is the digestion process. Here the linters are heated with dilute caustic soda solution—in some cases a soap or wetting agent is also added. The strength of the caustic soda solution varies, but is normally of the order of 2-5 per cent. The method of digestion can also vary from simple boiling in an open vat to more elaborate treatment under pressure, in large, specially constructed vessels. Pressure cooking in the absence of air gives a far more efficient purification. The alkali treatment causes solution of the lignin and any fats and other saponifiable impurities, without excessively reducing the viscosity of the linters. The caustic liquors are then separated from the linters, which are carefully washed with large volumes of water.



Seed after removal of staple fibre. Seed after removal of first cut linters. Seed after removal of second cut linters.

Fig. 2.—Cross sections of cotton seed during the removal of linters. Mag. 3 diameters. (Courtesy of Hercules Powder Co.)

The linters at this point are still stone to grey in colour and have to undergo a bleaching operation to give the chemically pure cotton needed for a high-grade acetate, of good colour and clarity. The bleaching is carried out by treating with chlorine, usually in the form of sodium or calciumhypochlorites, although gaseous chlorine is sometimes used. To avoid degradation of the cellulose, the bleaching treatment is sometimes performed in several stages, particularly as a little sulphuric acid is sometimes added to the bleach liquor to reduce the ash content of the fibres. The treatment of the cellulose with the bleaching liquor is carried out in large vats, fitted with a stirring mechanism and with provision for draining and introducing the wash liquors.

After the bleaching has been carried out under carefully controlled conditions, the linters are washed with large volumes of water. Traces of iron can be removed by an oxalic-acid wash at this stage.

The thoroughly washed linters are then transferred to large blending vessels, where they are mixed with other batches of similar grading. This blending process ensures a large stock with uniform properties, which is, of course, a great help in the control of the acetylation process.

The blended linters are next washed as a slurry over a grid system, which enables any remaining heavy impurities to be removed. The excess of water is squeezed out by passage of the linter slush through rubber rollers, and the squeezed linters are then "fluffed" by a special picking device ready for drying. The drying is carried out by passing the fluffed linters on a continuous belt through heated air tunnels. The tunnels are long and with elaborate control devices, which enable drying to a more or less definite water content to be carried out. Before storage or transfer to the acetylation plant, the dry linters are passed over magnetic separators and are then ready for use. The purity of an average batch of linters, treated in the manner described above, is often more than 99 per cent., with an ash content of about 0.1 per cent.

Woodpulp

The use of woodpulp cellulose for conversion to cellulose acetate became standard practice in Germany during the war owing to the virtually complete lack of cotton linters. Judging from the official American and British reports,* woodpulp cellulose was more difficult to

* References will be given at the end of Part 5 of this article.

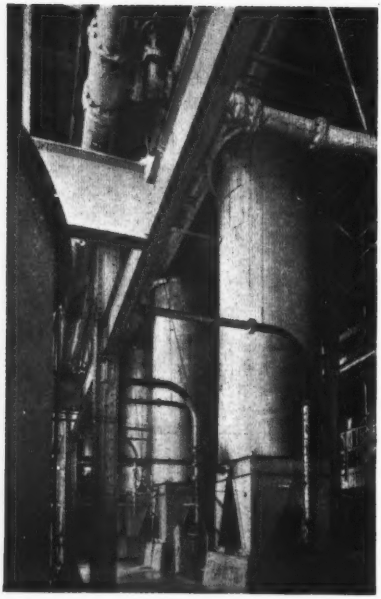


Fig. 3.—Digester for alkali treatment of cotton linters. (Courtesy of Hercules Powder Co.)

work with than linters, and gave an inferior acetate of poor colour and clarity. Nevertheless, substantial quantities were used with moderate success, and the best grade of woodpulp even yielded an acetate suitable for the exacting manufacture of film base. The two types of woodpulp used for acetylation were manufactured mainly from fir, spruce and beechwood, although, where necessary, other kinds of wood were used. The two methods employed were the normal sulphite process and the Wacker nitric-acid process. The latter does not appear to be widely used outside Germany, and the description given below is based mainly on official American reports.[2,3] As would be expected, in both cases the pulps were subjected to elaborate bleaching processes.

It should be mentioned here that wood only contains about 55 per cent. of cellulose, the residue mainly consisting of the lignin. This is the "cementing" material which binds together the cellulose fibres of the wood. This is usually present to the extent of about 30 per cent., the residual percentage being composed of various other materials, including resins and pentosans. The basic principle of all the processes for the preparation of woodpulp cellulose is to convert the lignin, pentoses, resins, etc., into soluble substances, which can be dissolved out and washed away, leaving behind substantially pure cellulose. This must be accomplished without undue degradation of the cellulose.

Sulphite Process

This is an old-established process, having been invented by the American chemist, Tilghman, in 1867. Bleached sulphite pulps from spruce and similar woods find extensive use for the manufacture of light-coloured and white papers, including tissue and printing papers, and are also used for preparing cellulose derivatives.

The logs of wood are first stripped of bark by a "tumbling" process under water. They are cut into chips of, roughly, uniform size by a special cutting machine. The chips are then fed into large digesters with an acid liquor consisting of water containing dissolved sulphur dioxide to the extent of about 5-6 per cent. In order to prevent an excessive degree of acidity forming during the digestion, calcium and magnesium bisulphites are added as buffers. Excessively low pH would cause undesirable degradation of the cellulose fibres. The digesters are then closed and the temperature and pressure raised by the introduction of live steam. The digestion or "cook" is continued for roughly 16 hours at a temperature of the order of 140 degrees C. and a pressure of, roughly, 75 lb. per sq. in. After the digestion is complete, the contents are screened and the resulting pulp washed free from the "cook" liquor, which is usually dark brown in colour at this stage.

Nearly one-half of the original weight of the wood is disposed of as soluble matter by the digestion process. There is also inevitably some loss of cellulose, due to hydrolysis. The pulp is dark-coloured at this stage and needs to be treated with chlorine water; this process again converts some impurities to a soluble state, and also improves the colour. The chlorination is usually carried out at room temperature and is followed by a wash with dilute caustic soda to neutralize and also to remove chlorinated impurities.

The washed pulp is then thickened to a solid strength of, roughly, 15 per cent., and then treated with sodium hypochlorite solution, which acts as a very effective bleaching agent. This bleaching process is repeated several times, followed by washing, in each case, with mild alkali. After the final bleach, the pulp is washed with very dilute sulphurous acid to remove residual hypochlorite, followed by repeated careful washing with large volumes of water. The pulp is screened, blended and sheeted, and finally dried at a temperature around 80 degrees C. A high-grade sulphite pulp, as used for acetylation, can have an α-cellulose content of up to 95 per cent.

Nitric-acid Process

In this process the wood chips are

Fig. 4.—Sulphite process : bolting on cover of charged digester. (Courtesy of Brown Company, U.S.A.)

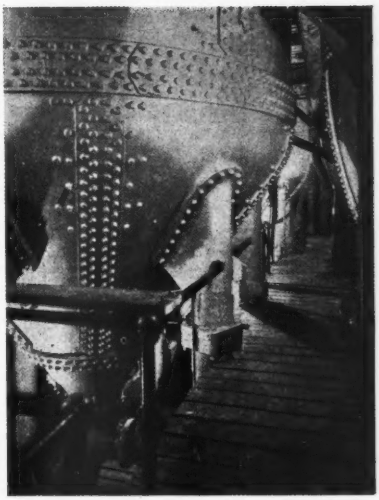


Fig. 5.—Sulphite process : bottom cone of digester. (Courtesy of Brown Company, U.S.A.)

treated in the digester with 14 per cent. nitric acid at room temperature. The heat of reaction, however, soon raises the temperature to about 40 degrees C. The temperature is then raised to around 50 degrees C., the pressure at this stage being of the order of about 2 atmospheres. The digestion continues under these conditions to a total time of about 10 hours. After this time, the acid is drawn off and recovered. Before recovery, the nitrated wood resins are skimmed from the surface of the acid. The digester is then filled with water, heated to a temperature of 80 degrees C. This results in a nitric-acid concentration of about 4 per cent. The digestion is then continued for seven hours, during which time the temperature rises to about 95 degrees C. and the acid concentration drops to 1 per cent.

After draining away excess acid, the charge is treated with 4 per cent. caustic soda for about 2 hours, drained, and water circulated for 1 hour. The pulp is then drained off and pumped to a wash filter over sand and knot catchers; here it

is washed. A yield of about 42 per cent. pulp on the dry wood is claimed. After thickening to a 5 per cent. slurry, the pulp, which is brown at this stage, is treated in a chlorinating tower with chlorine water at room temperature, the liquor containing about 7 per cent. available chlorine. The pulp is then washed in a filter, neutralized with 1 per cent. caustic soda, dried on rolls to a 50 per cent. water content, and then transferred to a purification tower, where it is treated with 12 per cent. caustic soda, followed by frequent hot-water washes. It is now subjected to a further bleaching treatment with sodium hypochlorite solution in a hollander. This operation is repeated several times, followed by antichlor treatment in each case, and finally washed, crêped and dried.

A typical analysis of this type of wood-pulp cellulose shows a cellulose content of about 98 per cent. It is seen from this figure that a much purer grade of cellulose is obtained by this method, but still does not approach the purity of a good cotton-linter cellulose.

Acetic Acid and Anhydride

The preparation of these materials lies really in the province of the chemical industry proper, and only brief mention of the processes involved will be made here.

There are several methods of preparing acetic acid in use commercially, starting with widely different raw materials. Undoubtedly, at the moment, however, the biggest proportion is made from acetylene, which is derived from calcium carbide and ultimately from coke and limestone This method has been mainly employed in Canada, Germany and the United States, the absence of cheap electric power in Britain being the chief cause of the establishment of a carbide industry here being hindered.

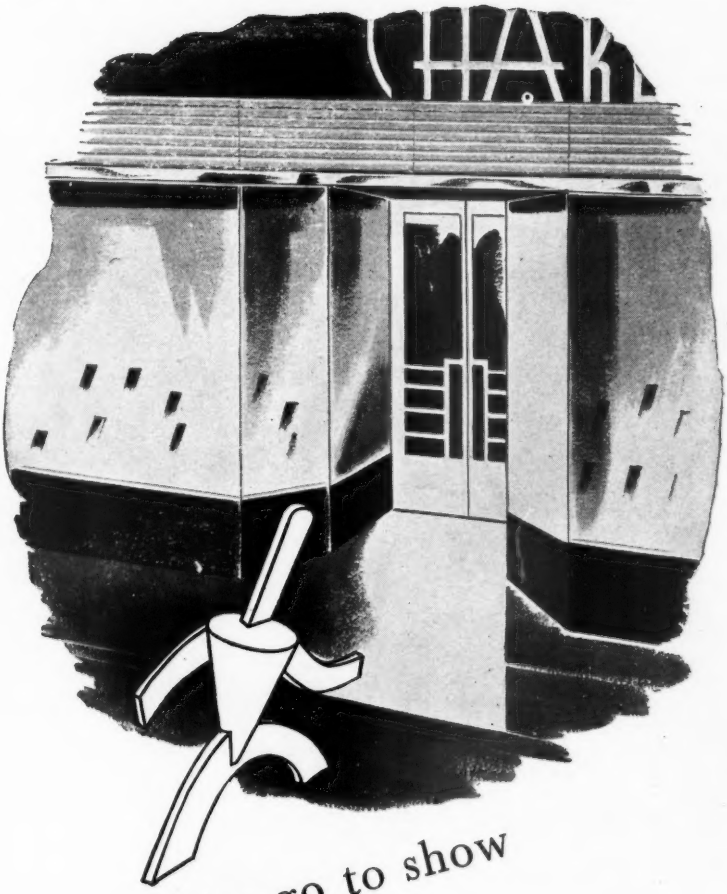
Acetylene is passed into dilute sulphuric acid containing a catalyst, usually a mercury salt, whereby it is converted almost quantitatively into acetaldehyde. This is easily oxidized with the aid of a catalyst to acetic acid. In Britain the bulk of the acetic acid produced is from the oxidation of ethyl alcohol. The alcohol is prepared from the fermentation of molasses, etc. Several other methods have been carried out on a commercial scale and have considerable possibilities. The "cracking" of petroleum and natural gases, leads, among other things, to ethylene and propylene; both of these olefines can be converted into acetic acid. Ethylene can be readily converted to ethyl alcohol, which can then be oxidized to acetic acid. Propylene can be oxidized to isopropyl alcohol, which can be dehydrogenated to form acetone. This can be made to yield ketene by a pyrolytic method, which can be reacted with acetic acid to produce acetic anhydride, as shown below.

Another possible source of acetic acid is water gas, which is obtained from steam and coke, and contains hydrogen and carbon monoxide. These can be made to react to form methyl alcohol, which, when treated with carbon dioxide under high pressure, forms acetic acid. Finally, acetic acid may be derived from wood waste, either by the old method of destructive distillation or by converting the wood into a dilute sugar solution by treatment with dilute acid. The sugar can be fermented and thus converted to alcohol, which can then be oxidized to acetic acid as before.

It should be pointed out that no account has been taken of the economic balance between the various methods described. A perfectly practical method of preparation may be abandoned because the market can be met at a cheaper price by an alternative method. This point is well illustrated by the fact that acetone is occasionally prepared by the catalytic decomposition of acetic acid.

The acetic anhydride is prepared from the acetic acid by methods approximating to catalytic dehydration. The anhydride is often prepared on the spot by the acetate manufacturer. The exact methods used are not generally made known, but

(Continued on page 449)

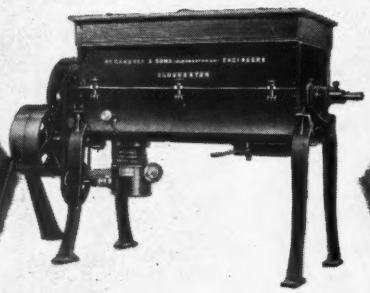


Plastics go to show

Plastics from I.C.I. are out to catch the public eye in every kind of shop and exhibition. 'Perspex' acrylic plastic sheet, for example, is such stuff as display designers' dreams are made of. It can be easily shaped or turned, drilled or cut, painted or engraved. It makes light and graceful stands which show goods at their best.

ICI

ACCURATE. CONTROLLED. CONTINUOUS FEEDING



GARDNER'S

Patent DIAPHRAGMIC FEEDER & MEASURER

ALSO MODELS FOR ADDING AT MULTIPLE POINTS Send details of your requirements

The GARDNER patent Diaphragmic Feeder and Measurer solves the problem of uniform feeding of material, and adding small quantities to bulk.

Many hours' supply of material can be available in the main chamber at one charge.

GARDNER'S patent "Rapid" sifting and mixing machines, for sifting and extracting lumpy and foreign materials, can be supplied in conjunction with this modern Diaphragmic Feeder.

WM. GARDNER & SONS (Gloucester) **LTD., BRISTOL RD., GLOUCESTER**
Telephone: Gloucester 2288 (3 lines). *Telegrams: "Gardner, Gloucester."*

LONDON: 19, Gray's Inn Chambers, 20, High Holborn, W.C.1. *Telephone: Chancery 7347.*

LETTERS TO THE EDITOR

Correspondents are reminded that a stamped and addressed envelope should be enclosed in all cases where a personal answer is desired.

Lavatory Seats

Sir,—As manufacturers of a toilet seat which fully conforms to British Standard Specification 1254, we naturally appreciate the letter from the Chairman of the Housing Section Committee of the National Council of Women, which you published in your June issue. She does well to advise architects and builders that her Committee approve "only seats with flat undersides," such as the one we mould. She has, however, in our opinion, challenged the British Standards Institution itself by also calling for "seats with open fronts." Specification 1254 on this point says, "The seats may be of the closed or open front pattern."

We, and doubtless other moulders, have taken the first alternative in response to the preference of architects and builders who represent the public preference. Since we conform to the specification and are yet to be convinced, along with the British Standards Institution, that the open front has practical or hygienic advantages, we make a closed front, which people prefer to see in a modern home. The fact that our seat is of plastic —and so impervious to moisture or chemical action—seems to us to meet any criticism of the closed front which your correspondent might advance. Since her letter might appear to advise rejection of a plastic product which has received very wide approval, we hope you may care to publish these comments.

E. K. COLE, LTD.

Ekco Works, Southend-on-Sea.

Pin "Bristles" for Hair Brushes

Sir,—We note in the June issue of "Plastics" (page 322) a letter requiring information on the supply of plastics pins for brushes. We are the manufacturers of the pins in question. They are injection moulded in large quantities for our customer, Denman Products, Ltd., Welwyn Garden City, for use in their "Denman" hair brush. We understand that both the pins and the brush are fully covered by patent.

We also note that you have not seen one of these brushes and enclose one

herewith. As a matter of interest, we believe we can claim that this is the first injection-moulded plastic pin for hair brushes.

PENDRY (PLASTICS), LTD.

126, Southwark Street,

London, S.E.1.

Acid-proof Containers

Sir,—In the June issue of "Plastics" (page 320), under the heading of "Acid-proof Containers," I have noted that you have received an inquiry for a plastic 6-gallon container which was required to be acid-proof and heat resisting up to 90 degrees C., and to be capable also of an internal pressure of 1½ atmospheres.

I am writing you regarding your reply, which states: "The large size of container

required excludes casting processes for the time being," and mentions certain "possibilities." May I remind you that my company have been marketing for some 15 years Keebush acid-proof containers and chemical plant which are capable of withstanding most acids at temperatures up to 130 degrees C. Further, the reasonably small size of container required by your correspondent could be designed to withstand internal pressure of 1½ atmospheres. In this respect it may interest you to know that some of our Keebush pipework was recently tested to failure, the breaking-down point being with an internal hydraulic pressure of 2,600 lb./sq. in.

Our general catalogue illustrates a few of the applications of our material. Here you will see tanks 90 ft. long, a vacuum filter 5 ft. diameter, and many other units which will illustrate to you that Keebush material is well within the scope of your correspondent's requirements.

G. H. BLACK,

Kestner Evaporator
and Engineering Co., Ltd.
London, S.W.1.

Chessmen

Sir,—The article on moulded chessmen in the July issue of "Plastics" (page 383), is of special interest to us, particularly the statement that only one instance of moulded chessmen has previously been recorded, these being solid.

It might interest you to learn that in April of last year we designed, in conjunction with Toolmakers and Designs, Ltd., of Coventry, a set of chessmen having hollow cores and weighted and felted bases. Only the shortage of moulding powder has prevented these from being marketed, a situation we hope to remedy in the very near future.

Taking the Staunton pattern as our model, a design was made which, in our opinion, adds to the appearance by slightly modifying several details which appear necessary in production in wood, but not so in moulding technique. A 16-impression mould was made for a full club-size set, and only for the knight is a split mould employed.

In passing, may I submit that the chessmen illustrated on page 347, as made from "Perspex," are far from ideal, and have more objections than the old St. George pattern. J. H. BERRY.

Portland Works,
Annesley, Woodhouse, Notts.

Radio-frequency Heating

Sir,—In your review of plastics machinery at the British Industries Fair, 1947, it is stated that in the new field of "radio-frequency" heating "there were three exhibitors," who are named. We are sorry to note that you overlooked the fact that we were exhibiting Ferranti-Wild-Barfield pre-heaters on our own stand, and had also loaned one to Turner Manufacturing Co., Ltd., for demonstration purposes.

WILD-BARFIELD ELECTRIC FURNACES, LTD.
Elecfurn Works, Watford, Herts.

Plastics in the Netherlands

Sir,—We thank you for inserting our appeal for back issues of "Plastics." Several readers wrote to us announcing their readiness to place back issues at our disposal. As a result, we have now obtained the literature which appeared during our time of isolation. Should you have any inquiries about the plastics industry in the Netherlands, we will reciprocate your kindness.

THE PLASTICS INSTITUTE T.N.O.
Delft, Holland, Julianalaan 134.

Comb Imports

Sir,—From good authority we have learned that the British Board of Trade will allow an import of combs from Denmark for an amount of £5,000.

As it is very important to us to come into connection with British importers who are interested in buying combs made of thermoplastic materials we should be obliged to you if you could put us in touch with a few big importers to whom we might send quotations.

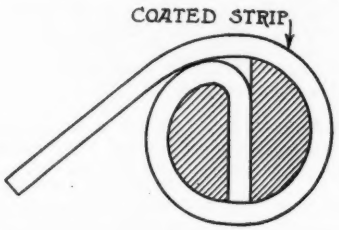
Denmark. NORDISK KAMFABRIK.

PRODUCTION NEWS

Raw Materials, New Plant, Works Organization, Control Apparatus, Research, Personal and Trade Notes

ASSESSING A SURFACE COATING.—The measurement of flexibility and the degree of adhesion of surface coatings is likely to be simplified by a recent invention of Dr. W. H. Chatfield, 13b-15b, Stafford Road, Croydon, Surrey, who refers to his new apparatus as a "flexibilometer."

It is commonly known that if a coating or film has been applied to the surface of a flexible material, and the whole is bent, with the coating on the outside of the bend, definite degrees of stretching or elongation will take place. Moreover, if the coating cannot accommodate this stretching, it cracks, and may even detach itself from the surface of the flexible material.



In applying this principle for an accurate assessment of the properties mentioned, a strip of the coated material is caused to wind upon itself in spiral fashion by aid of a rotating mandrel, which sets the initial diameter of the bending. In this manner a continuously diminishing strain is produced in the coating, and this strain ultimately reaches a point where no cracking will occur. Making due observation of the tendency to crack and the point where it ceases, the radius of the outer surface of the coated strip at the particular point is measured. From this data it is then possible to calculate the percentage stretch or elongation which the coating permits without suffering damage.

In the construction of the apparatus, means are provided to ensure that the coated strip follows a perfect spiral as it winds upon itself by the rotation of the mandrel, and that it is otherwise wound uniformly. For this purpose a slight tension is applied to its free end by pressing between two rollers, one of which may be adjusted vertically for the application of suitable pressure. To eliminate errors which are likely to arise from temperature variations, the apparatus is installed in a small thermostatically controlled box.

For convenience in winding the strip in truly spiral fashion at the very commencement of the test, the mandrel is shaped as shown in the accompanying sketch, instead of having a circular cross-section. The slot is provided for anchoring the strip when commencing to rotate the mandrel. By varying the speed with which winding takes place, it is possible to determine the effects of either gentle stretching or sudden stretching applied to the coating under examination. The apparatus can be adapted particularly for measuring the flexibility and degree of adhesion of films of varnish or lacquer.

MELAMINE RESINS.—British Industrial Plastics, Ltd., announces that an agreement has been reached for the exchange of patents and information regarding melamine resinous products with Ciba, Ltd. As a result of this agreement The Beetle Products Co., Ltd., is now in a position to supply melamine resins for development purposes in several fields, though at present only in strictly limited quantities due to shortage of manufacturing facilities. It must be clearly understood that the right to charge royalties on the application of such resins on a commercial scale is reserved by the patentees.

BRITISH PLASTICS FEDERATION.—A conference will be held at the Burlington Hotel, Bournemouth, from Thursday, October 2, to Monday, October 6. The detailed programme is shortly to be issued to members. There will be two business sessions at which matters of general interest to members of the Federation will be discussed. Various social functions of interest to members and their ladies, who will be attending the conference, have also been arranged.

A new section of the Federation has been formed within the Plastics Material Manufacturers Group, to cater for those interested in the manufacture and sale of synthetic resins for the surface coating industries.

There are, at present, 14 members of the Section; applications for new members are being considered. This recent development does not affect the existing Synthetic Resin Section of the Federation.

LIGNIN—According to further information received from Samuel Jones and Co., Ltd., and R. H. Cole and Co., Ltd., the news item appearing in our July issue (page 381) requires amplification. Sales of "Tomlinite" lignin for distribution in Great Britain are now handled by R. H. Cole and Co., Ltd., on behalf of Howard Smith Paper Mills, Ltd.

Samuel Jones and Co., Ltd., are the present agents and distributors for all paper manufactured by Howard Smith Paper Mills, Ltd., and as such will eventually handle lignin impregnated papers when available in sufficient quantities.

TENNESSEE EASTMAN CORPORATION is offering Tenite III, a cellulose acetate propionate plastic in pellet and granular form for injection moulding and continuous extrusion. The plastic is said to have superior impact strength, higher dimensional stability and less odour than previously developed types. The material is the third in Tennessee Eastman's series of cellulosic plastics. The other two which are already in wide use are Tenite I (cellulose acetate plastics) and Tenite II (a cellulose acetate butyrate plastic).

HORNERS' COMPANY AT EKCO WORKS.—Mr. Guy Neville, the Master, and Mr. T. F. Clarke, the Clerk of the Worshipful Company of Horners, recently made a tour of the Ekco Works of E.K. Cole, Ltd., at Southend-on-Sea. They were entertained by Mr. N. C. Robertson, deputy managing director, who is also a member of the Horners' Company.

BRITISH MOULDED PLASTICS LTD. Mr. C. Milton Marshall, works manager, has been elected to the board and appointed works director.

MOULDED PRODUCTS LTD.—Mr. B. A. Ensell has been appointed managing director. Mr. N. D. Newall and Mr. H. P. Bridge have joined the board. Mr. D. E. Lowndes, works manager, has been appointed works director. Mr. H. W. F. Ireland still retains his interest as director of the parent company, National Plastics Ltd., and the subsidiaries, which are British Moulded Plastics Ltd. and Moulded Products Ltd.

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION.—The first meeting of the Council of the I.S.O. was held in Zurich, June 17 to 20. The Council consists of the National Standards bodies of United Kingdom, Australia, Belgium, Brazil, China, France, India, Norway, Switzerland, U.S.A., and U.S.S.R. An extensive programme of technical work is to be submitted to the standards organizations in the different countries for consideration. The office of the organization is at Geneva.

MONSANTO CHEMICALS, LTD., state that rumours to the effect that supplies of "Lustron" polystyrene moulding powder would be considerably reduced as a result of the destruction of their Texas City plant, have proved unfounded. Facilities for the production of Lustron at Springfield, Massachusetts, and at Montreal, are in full swing.

A. C. WICKMAN, LTD., announce the appointment of Mr. G. C. Trowbridge as managing director in succession to Mr. A. C. Wickman, who has resigned that position but remains chairman of the company. Prior to this new appointment (April 1), Mr. Trowbridge was deputy to Mr. Wickman.

MR. R. R. ROLLES has been appointed acting chief chemist at the Walthamstow works of British Moulded Plastics, Ltd.

THE PLASTICS INDUSTRY GOLFING SOCIETY held its fourth meeting of the season at Hindhead Golf Club, Hindhead, Surrey, on July 9 to compete for a new trophy donated by Mr. John E. Ferguson, known as the "Airborne" trophy, to commemorate his classic Derby win in 1946. Some 50 members competed for this trophy over 18 holes medal play. The result was a tie between Mr. P. Chaumeton, handicap 10, and Mr. J. A. Coubrough, handicap 16, who both returned a net score of 71. The tie was decided over a further 18 holes medal play in the afternoon, when Mr. P. Chaumeton returned the magnificent score of 68 net, to become the first winner of the "Airborne" trophy.

THE INSTITUTE OF THE PLASTICS INDUSTRY has changed its name to The Plastics Institute. The address remains as hitherto, The Adelphi, Adam Street, London, W.C.2.

New Productions from the Moulding Shops

Developing Dish

The developing dish which we illustrate—designed and moulded by United Ebonite and Lorival, Ltd.—is of light, but strong, thermosetting plastic. It can be used with equal success for most processing solutions, and does not stain readily. Outstanding features include the large pouring lip and grooves at each end to facilitate the removal of the prints. Various sizes are made.

Engineers' Gauge Boxes

This practical set of gauges for precision engineering, manufactured by the Coventry Gauge and Tool Co. Ltd., was shown at the Birmingham Section of the B.I.F. The box, which measures 10 ins. by 8 ins. by 2 ins., is moulded in Bakelite X20/5 (black) by W. H. Tant and Co., Ltd. The cost of such a set of gauges may be in the range of £200 to £300, and this consideration alone demands the use of a storage box made of some material which will give all possible protection to the contents.

World's Smallest Camera?

There have been many miniature cameras, but the one pictured below is probably the smallest in big production. We refer to those low-priced ones the normal public can buy, and not to those which enemy spies wear in their ties disguised as a gold horse-shoe pin.

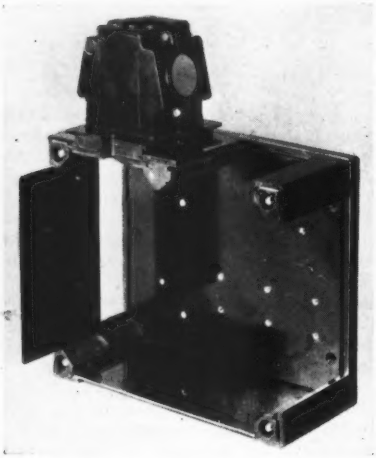
The Coronet Cameo made by Dufay-Chromex, Ltd., had its origin about 1935. The present one has been redesigned by Mr. F. J. Pettifer, manager of the Camera Department, and is a very excellent job. It is mainly of black cellulose acetate produced on a 4-oz. injection machine with a complete set of the plastic components in one mould, so that the units for one camera are produced every 40 seconds. The cellulose acetate parts weigh only one ounce, the complete camera with shutter, lens and metal eye-level viewfinder weighing 1¾ oz.

Sad to tell, this camera is for export only, but it is hoped that with the new plastic materials now being developed at the

works, it may be possible to expand production for Great Britain. The actual picture size is 12 mm. by 17 mm., but enlargements up to 5 ins. by 7 ins. can be made without loss of detail.

Electrical Distribution Boxes

Low voltage distribution of electricity supply as provided for in the "Mettric" extensible service termination (J. G. Statter and Co., Ltd.) is so simplified that any desired number of units may be arranged to suit the shape of the space available. The standard boxes are made of Bakelite material, and are designed to allow them to interlock to form a rigid structure when



completely assembled. As may be seen from the accompanying illustrations, the individual mouldings, and principle of construction generally, represent an unusually good example of what may be done when using Bakelite.

The "Mettric" service termination, which is patented, is constructed of a base to which four rabbeted pillars are attached, one at each corner. These pillars receive the top, bottom and side panels and have a metal centre stem which is used both for attaching the pillars to the base and also for securing the cover. Extra pillars can be provided in the centre of one or more of the sides in order to provide for the fitting of cable boxes where necessary. The cover is provided with the necessary retained and sealable fastenings.

The essential feature of the design is that by means of extension pieces inserted into the rabbeted corner pieces, further boxes can be attached both vertically and horizontally. These extension inserts are so designed that they allow easy wiring from box to box.

The whole unit, including the fuse carriers, is comprised of moulded components with the exception of the side plates, which are of Bakelite laminated material. The moulding powder used is Bakelite X20/5. Tools for all the mouldings have been designed in the tool department of J. G. Statter and Co., Ltd., Amersham Common, Bucks. For the base a single impression tool is employed, with a Bradley and Turton 100-ton press, working at 100-tons pressure. The inserts are placed on the bottom half of the mould, moulding powder is placed in the four corners and at the centre, and the mouldings are automatically ejected after a cure of five minutes (no preheating). For the cover, under otherwise identical conditions, a cure of two minutes is allowed. For the corner pillars, moulded horizontally. with five minutes cure, a two-cavity mould is employed; this tool has removable ends for holding inserts.

The fuse carriers are produced with a six-impression tool, with three minutes cure, employing the same presses. Here the inserts are placed in the top portion of the mould, and are held in by means of a groove in the insert holder and one turn of spring steel wire; this has proved more favourable than other forms of insert holders.

PATENT REVIEW

The following abstracts have been made from specifications at the Patent Office, with the permission of the Controller of H.M. Stationery Office. Complete specifications can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1/- each.

B.P. 586,845. Application date: 20.3.44. Convention date (U.S.A.): 19.2.43. Accepted: 2.4.47.

Improvements in or relating to Bonding of Optical Elements and the Complex Optical Elements produced. To: International Polaroid Corporation.

Manufacture of complex optical elements by applying to the adjacent faces of a plurality of optical elements of transparent plastic material (polystyrene and/or polycyclohexyl methacrylate) an adhesive comprising a high melting polyvinyl compound and drying this adhesive whilst the elements are maintained under pressure.

B.P. 586,881 Application date: 2.8.44. Convention date (U.S.A.): 2.8.43. Accepted: 3.4.47.

Improved Process for the Polymerization and Copolymerization of Acrylonitrile. To: Imperial Chemical Industries, Ltd.

B.P. 586,933. Application date: 4.9.44. Accepted: 8.4.47.

Improvements in or relating to the Manufacture of Compound Fabrics. H. Meyer. To: Hart Productions, Ltd.

Process for the manufacture of compound fabrics by coating or impregnating a fabric with a solution or dispersion of an initial condensation product of a thermosetting resin obtained by condensation of urea and formaldehyde, and a solution or dispersion of a water-insoluble thermoplastic resin. The fabric is dried at a temperature insufficient to convert the condensation product into the infusible or insoluble state but sufficient to expel the solvents or water. The coated or impregnated fabric is associated with one or several layers of uncoated and unimpregnated fabric and the associated layers subjected to heat and pressure without application of a solvent for the thermoplastic. The temperature used is sufficiently high to convert the condensation product into the infusible and insoluble state whilst the thermoplastic resin is sufficiently softened to bond firmly with the layers of uncoated fabric.

B.P. 586,956. Application date: 29.10.43. (Divided out of B.P. 586,187.) Convention date (U.S.A.): 29.10.42. Accepted: 9.4.47.

Improvements in and relating to Organo-Silicon Compounds. To: The British Thomson-Houston Co., Ltd.

B.P. 587,023. Application date: 3.11.44. Accepted: 10.4.47.

The Production of Rubbers and Plastics in Sponge-like or Cellular Form. A. S. Briggs and G. E. Scharff. To: Imperial Chemical Industries, Ltd.

Production of cellular rubbers or plastics by intimately mixing the rubber or plastics in the unvulcanized or uncured state with an organic compound such as di-N-nitrosopentamethylene tetramine, di-N-nitrosopiperazine, trimethylenetrinitrosamine or succin-bis (N-nitrosomethylamide) and heating the mixture to decompose the organic compound.

B.P. 587,046. Application date: 19.10.44. Accepted. 11.4.47.

An Improved Method of and Means for Metallizing Electrically Non-conductive Threads. C. T. Suchy. To: Callender-Suchy Developments, Ltd.

B.P. 587,063. Application date: 2.1.45. Convention date (U.S.A.): 5.5.44. Accepted: 11.4.47.

Improvements in or relating to the Manufacture of Polymerizable Esters. To: United States Rubber Co.

Refers to the manufacture of allylic ortho-benzoyl benzoates useful as lubricants, plasticizers, adhesives and for coatings. Also refers to the manufacture of interpolymers which can be extruded into filaments or moulded.

B.P. 587,160. Application date: 17.4.44. Convention date (U.S.A.): 17.4.43. Accepted: 16.4.47.

Improvements in or relating to Synthetic Resins for Use in Producing Electrical Insulation. To: Westinghouse Electric International Co.

Insulating material consisting of mica flakes or other similar dielectric flaky materials and a binder for bonding into a predetermined shape. The binder is the reaction product of penta-erythritol (1 mol), maleic acid or maleic acid anhydride (1.5 mol) and phthalic acid or phthalic acid anhydride (.5 mol).

B.P. 587,163. Application date: 26.5.44. Convention date (U.S.A.): 4.2.44. Accepted: 16.4.47.

Improvements relating to Tubes or Packages and Methods of making the same. To: Wingfoot Corporation.

Tubes or packages incorporating a readily visible protected indicia strip or label.

B.P. 587,172. Application date: 15.7.44. Convention date (U.S.A.): 24.11.43. Accepted: 16.4.47.

Improvements in or relating to High Frequency Dielectric Heating Apparatus. To: Sangamo Weston, Ltd.

B.P. 587,186. Application date: 6.10.44. Accepted: 16.4.47.

A New or Improved Method for Manufacturing Articles from Plastic Materials by Injection Moulding, and the Articles so produced. J. Veit and J. F. Kenure.

Manufacture and means of manufacturing multi-coloured articles from thermoplastic materials by injection moulding by taking a plurality of batches of different-coloured plastics and feeding them simultaneously, each by separate injection means, into a common mould where the different-coloured plastics are moulded simultaneously to one and the same article merging integrally into one another so that an article is formed the surface of which is multi-coloured.

B.P. 587,231. Application date: 18.8.43. Accepted: 18.4.47.

Preparation of Resinous Condensation Products. To: American Cyanamid Co.

Resinous condensation products prepared by heating cyanamide or guanidine with dextrose, sucrose or starch and casein, fatty acids and/or primary aliphatic amines containing 6 or more carbon atoms.

B.P. 587,282. Application date: 11.8.44. Convention date (U.S.A.): 11.8.43. Accepted: 21.4.47.

Improvements in the Moulding of Hollow Bodies from Plastic. To: Ford Motor Co., Ltd.

Moulding of hollow cellular bodies by arranging a plurality of rolls between interlaminated sheets of impregnated materials, each of these rolls consists of a granular core enclosed in an impermeable tubular sheath which in turn is enclosed in an outer wrapping of resin impregnated material. The whole assembly is then subjected to heat and pressure and the granular core removed afterwards.

B.P. 587,286. Application date: 7.12.44. Accepted: 17.4.47.

Improvements in Toy Building Blocks. H. F. Page.

Patent of addition to B.P. 529,580.

Interlocking moulded toy building blocks.

B.P. 587,303. Application date: 1.12.44. Convention date (U.S.A.): 1.4.44. Accepted: 21.4.47.

Improvements in or relating to Compositions containing Primary Aromatic Amine-Aldehyde Resins. To: Norton Grinding Wheel Co., Ltd.

Resinous compositions or resin bonded bodies such as grinding wheels bonded with polymerized condensation products of a primary aromatic amine with an aldehyde.

B.P. 587,350. Application date: 17.2.43. Convention date (U.S.A.): 27.2.42. Accepted: 23.4.47.

Improvements in and relating to Synthetic Resinous Products from Furfuryl Alcohol. To: The British Thomson-Houston Co., Ltd.

Method of producing liquid resins by reacting furfuryl alcohol with a chlorinated alkaryl phosphate which is capable of slowly liberating hydrogen chloride when heated, and heating the mixture for a period sufficiently long to initiate resinification but insufficient to allow solidification of the reaction product.

B.P. 587,354. Application date: 19.4.44. Accepted: 23.4.47.

Improvements in or relating to the Manufacture of Resinous Condensation Products. A. Brookes. To: British Industrial Plastics, Ltd.

Manufacture of hardened resins from melamine, ammeline or melam by condensation with formaldehyde under heat and hardening the condensation product alone or associated with inert materials by heat treatment or ageing.

B.P. 587,355. Application date: 4.5.44. Convention date (U.S.A.): 22.3.43. Accepted: 23.4.47.

A Plastic Hollow Cap. To: Wheeling Stamping Co.

Reinforced plastic hollow internally screwed and threaded thin-walled cap in which a fabric reinforcing sheet with a film of exuded resin serves as the thread-forming surface.

THE MICANITE & INSULATORS CO. LTD.

Empire Works, Blackhorse Lane, Walthamstow, London, E.17.

Manufacturers of MICANITE (Built-up Mica Insulation). Fabricated and Processed MICA. PAXOLIN Laminated Materials. EMPIRE Varnished Insulating Cloths and Tapes. HIGH VOLTAGE BUSHINGS and TERMINALS. Distributors of Micoflex-Duratube sleevings.

YOU ARE RIGHT WITH NESTORITE

OUR *Technical Director* **EXPLAINS:**

It is important to realise that a plastic moulding has no scrap value ; if the material is wrong, the loss in time, money and reputation is irrevocable.

It is because there must be NO risk of error that our Technical Research Department is such a vital "nerve centre" of Nestorite Service.

Each batch of raw material is rigorously tested—chemically and physically. Each ensuing Works process is Laboratory-checked, and when the finished powder is ready for despatch samples from drums are again tested for uniformity in texture, colour and moulding properties in our experimental Moulding Presses.

That's why you're right with NESTORITE.

JAMES FERGUSON & SONS LTD

MERTON ABBEY LONDON S.W.19
TELEPHONE: MITCHAM 2283/7

JOSE DELCLOS, Gignas, 39 Barcelona (2), Spain.
EINAR HOLMARK, 19, Gl. Kongevel, Copenhagen V., Denmark.
A. S. HARRISON & Co., Pty. Ltd., 85, Clarence Street, Sydney, Australia.
ANDRE BERJONNEAU, Boulevard des Batignolles, 33, Paris (Ville), France.

B.P. 587,361. Application date: 18.8.44. Accepted: 23.4.47.

Improvements in or relating to Apparatus for Heating by High Frequency Electric Currents. A. J. Maddock. To: Standard Telephones and Cables, Ltd.

High frequency heater consisting of two electrodes and an enclosure for these electrodes. The door of this enclosure is connected with one or both electrodes in such a way that opening of the door results in a relative movement of the electrodes away from one another.

B.P. 587,378. Application date: 4.12.44. Accepted: 23.4.47.

Improvements in or relating to the Manufacture of Ethylene. E. Hunter, C. G. P. Feachem and R. B. Richards. To: Imperial Chemical Industries, Ltd.

Manufacture of ethylene under high pressure by dehydration of ethanol, at pressures between 350 and 1,500 atmospheres and temperatures between 300 and 600 degrees C. The dehydration catalyst is activated alumina or phosphoric acid. One of the features of the process is that the product of the process may be polymerized directly whilst still under elevated temperature and pressure by the action of a catalyst such as a percompound or oxygen.

B.P. 587,391. Application date: 23.5.41. Accepted: 24.4.47.

Improvements in or relating to the Polymerization and Interpolymerization of Low Molecular Weight Olefins. I. L. Clifford, E. G. Williams and R. B. Richards. To: Imperial Chemical Industries, Ltd.

Manufacture of solid and semi-solid polyethylenes by subjecting ethylene to elevated pressure in contact with a liquid phase and a percompound (which is insoluble in the liquid). The percompound is introduced in dispersed or emulsified form.

B.P. 587,395. Application date: 30.9.43. Accepted: 24.4.47.

Improvements in or relating to Low Temperature Polymerization Processes. To: Standard Oil Development Co.

Polymerization of olefins or olefin mixtures at temperatures below 0 degree C. employing a catalyst which is a chlorobromide of aluminium, titanium or boron dissolved in a low-boiling hydrocarbon solvent which is inert with respect to the chlorobromide. Refers especially to isobutylene.

B.P. 587,403. Application date: 4.5.44. Convention date (U.S.A.): 20.2.43. Accepted: 24.4.47.

Improvements in the Manufacture of Compositions and Textile Articles having a Basis of Vinyl Polymers. E. W. Rugeley, T. A. Feild, Jr., and J. L. Petrokubi. To: Carbide and Carbon Chemicals Corporation.

Textile fibres or filaments made by copolymerizing a vinyl halide and acrylonitrile.

B.P. 587,439. Application date: 5.10.42. Convention date (U.S.A.): 7.10.41. Accepted: 25.4.47.

Improvements in and relating to the Manufacture of Polymeric Materials. To: E. I. Du Pont de Nemours and Co.

Refers to polyamide composition of improved dyeing properties and comprises interpolymerization of equi-molecular proportions of hexamethylene, diamine and adipic acid or polyamide-forming derivatives of these with 5 to 15 per cent. of a linear polyamide-forming compound comprising a bi-functional amide-forming reactant containing a secondary amino group.

B.P. 587,444. Application date: 15.3.43. Convention date (U.S.A.): 21.3.42. Accepted: 25.4.47.

Improvements in the Manufacture of Stabilized Vinyl Resins. To: The British Thomson-Houston Co., Ltd.

Stabilizing of vinyl halide polymers or copolymers with phenoxy lead stearate.

B.P. 587,445. Application date: 2.4.43. Convention date (U.S.A.): 11.4.42. Accepted: 25.4.47.

Improvements in and relating to Interpolymerization Products. To: The British Thomson-Houston Co., Ltd.

Copolymers of vinyl chloride and an itaconic ester (more than 90 per cent. of vinyl chloride and 1 to 10 per cent. of an itaconic ester) having improved flexural and impact strength, specially suitable for moulding, laminating, casting, coating and adhesives.

B.P. 587,446. Application date: 19.5.43. Accepted: 25.4.47.

Modification of the Properties of Polyamides. J. G. Cook, R. C. Seymour. To: Imperial Chemical Industries, Ltd.

Refers to a process for the modification of the properties of unsaturated polyamides by combining the latter with sulphur on a rubber mill at elevated temperature and also employing a vulcanization accelerator.

B.P. 587,455. Application date: 25.8.44. Accepted: 25.4.47.

Improvements relating to the Production of Polymerized Vinyl Products. B. T. D. Sully. To: A. Boake Roberts and Co., Ltd.

B.P. 587,475. Application date: 29.9.43. Accepted: 28.4.47.

Improvements in or relating to Low-temperature Catalytic Polymerization. To: Standard Oil Development Co.

Low-temperature polymerization of olefinic materials by the polymerizing action of alkoxy compounds of the Friedl-Krafts metals.

B.P. 587,492. Application date: 10.10.44. Convention date (U.S.A.): 3.5.44. Accepted: 28.4.47.

Polymers of Unsaturated Esters. To: Wingfoot Corporation.

Esters are prepared from allyl alcohol or a 2-substituted allyl alcohol and a diethyl ether dicarboxylic acid containing at least 2 and not more than 4 ethylene groups. These esters are then copolymerized with vinyl or vinylidene compounds.

B.P. 587,557. Application date: 11.10.44. Convention date (U.S.A.): 28.10.43. Accepted: 29.4.47.

Production of Synthetic Resins. F. A. Bent and E. A. Peterson. To: Shell Development Co.

Synthetic resins produced by reacting tall oil with a polymeric allyl alcohol, polymeric allyl ester or a monomeric allyl ester under simultaneous application of heat.

B.P. 587,580. Application date: 1.6.44. Accepted: 30.4.47.

Joined Thermoplastic Insulating Cables. J. N. Dean, H. F. Wilson and E. I. Cooke. To: The Telegraph Construction and Maintenance Co., Ltd.

B.P. 587,586. Application date: 18.8.44. Accepted: 30.4.47.

Improvements in and relating to the Production of Organic Polymers. D. J. Loder and W. F. Graham. To: E. I. Du Pont de Nemours and Co.

Polymers prepared from 1,3-dioxolane or substituted 1,3-dioxolanes by reaction with compounds containing ethylene or acetylenic unsaturation, in the presence of a catalyst.

B.P. 587,603. Application date: 13.11.44. Accepted: 30.4.47.

Improvements in the Manufacture of Capsules, Collapsible Tubes and Similar Containers from Plastic Material. K. Posner.

Manufacture of plastic capsules, collapsible tubes, etc., which are provided with a nozzle comprising the means of retaining the cap.

B.P. 587,618. Application date: 18.1.44. Accepted: 1.5.47.

An Improved Manufacture of Polymeric Substances. To: Standard Oil Development Co.

Low-temperature polymerization or copolymerization of olefins in the presence of a Friedl-Krafts catalyst. The olefins consist of an alkoxy-polyene alone or of an alkoxy-polyene mixed with a polyene or with an iso-olefin or mixtures thereof.

B.P. 587,671. Application date: 1.11.43. Accepted: 2.5.47.

Improvements in or relating to Coated Fabrics. W. Yarworth-Jones.

Coated frabric which combines high non-shattering properties with high flexibility so that it can be bent or curved without losing strength. The method of production consists in coating a woven fabric having warp and weft textile threads and warp and weft metal threads or wires with an amount of doped lacquer or paint which is sufficient to form a skin.

B.P. 587,687. Application date: 9.8.44. Convention date (U.S.A.): 9.8.43. Accepted: 2.5.47.

Improvements in or relating to Pressure-sensitive Flexible Sheet Materials. To: Imperial Chemical Industries, Ltd.

Pressure-sensitive, adhesive sheet comprising a backing material on which there is deposited a pressure-sensitive adhesive coating consisting of 100 parts of polyvinyl-butyrate resin containing up to 5 per cent. polyvinyl acetate, 8-13 per cent. polyvinyl alcohol and 67-230 parts of a plasticizer which is a solvent for the resin below 45 degrees C. (dibutyl phthalate).

B.P. 587,795. Application date: 25.10.44. Convention date (U.S.A.): 25.10.43. Accepted: 6.5.47.

Improvements in or relating to Laminated Materials. To: E. I. Du Pont de Nemours and Co.

Manufacture of electrical insulation materials comprising alternate layers of polytetrafluorethylene in solid form and silaceous material. The assembly so obtained is subjected to heat and pressure so that the alternate layers are bonded together to form a laminated structure.

The Microscopic Examination of Plastic Materials

VI.—Mouldings (Fillers)—(f) Fibrous Materials

By J. H. WREDDEN, F.R.M.S.
(Chief Chemist, Igranic Electric Co., Ltd.)

CONTINUING our examination of the jute fibre and its evaluation as a potential filling medium for moulding powders, we have seen and discussed briefly its morphological characteristics both macro- and microscopic, and it would seem that, structurally, it has certain advantages over hemp when used in this way. The chief of these would at first sight appear to be the thick rigid wall of the fibre element, which results in an open lumen or bore, affording possibilities of easy impregnation of the filler particle with resin; further examination, however, produced evidence with regard to large variations occurring in the bore which tended to negate this advantage to some extent.

This variation in bore is important in view of the impermeability of the already thick cell wall, which must be regarded as being high, in spite of the fact that evidence was obtained pointing to the apparent existence of pit channels traversing the wall thickness. This evidence was, however, far from conclusive, inasmuch as there were no signs of prolific pitting and no sign of their existence at all when the elements were examined in longitudinal optical section; therefore, the existence of these pits must be treated with extreme caution, as a result of which it is far safer to assume that they do not exist at all. Thus we are left with no alleviation of the disadvantages arising out of the existence of the variability in bore diameter, except the fact that even where this is considerably reduced, the rigid nature of the wall keeps it open and hence increases the chances of the element being filled with resin, which, in fact, when coupled with tensile strength of some 70,000 p.s.i., warrants further investigation of the properties of this material.

One factor which may play an important part in the utility of the jute fibre as a filler is the availability of the lignin present. This is worthy of consideration in view of the influence which this material appears to exert in the case of the coconut shell, for in this instance we have seen that in spite of a not wholly desirable particle shape, coconut shell flour produced beneficent properties in the finished moulding which were beyond normal expectations. Therefore, it is not at all improbable that jute is capable of producing similar results in the same manner due to its comparatively high lignin content, as it has a lignin content of some 24 per cent. (when taken as total pectates) compared with a figure of 9 per cent. for hemp taken in the same way.

Having thus seen some of the possibilities in jute, let us turn our attention to another fibre of great commercial importance in the form of ramie, and in so doing revert to that group of plant which is such a prolific source of fibre-producing species, the nettles or Urticacae. Ramie fibre is obtained from

Table 1.—Type of Fibre.

	Ramie	Hemp	Flax	Silk	Cotton
Tensile Strength	100	36	25	13	12
Elasticity ..	100	75	66	400	100
Torsion.. ..	100	95	80	600	400

the bast tissue of the harmless nettle, Boehmeria tenacissima, native to tropical and sub-tropical climates. In actual fact, there are two kinds of commercial fibre known as ramie, the so-called green ramie obtained from the aforementioned plant, and the white ramie extracted from the China grass plant (Boehmeria nivea), this latter being chiefly found in temperate climates. The two fibres are almost exactly alike in appearance and behaviour so they can be considered under one heading of " ramie."

The ramie fibre has been known to the Chinese for a considerable time, and was probably used by them at a very early period in the history of civilization. It has also been suggested, and there is some evidence to show, that it might have been used several thousands of years ago by the Egyptians in conjunction with flax in the manufacture of mummy cloth.

The ramie plant is a shrub, growing from some 4 ft. to 6 ft. in height. It is cultivated in India and China, and has also been grown in America; it is capable of cultivation within broad limits of climatic conditions.

Ramie is probably the strongest and most durable of all vegetable fibres; the isolated filaments possess about three times the tensile strength of the hemp filament when no particular care has been taken over their separation, but with very careful breaking down the fibre is capable of furnishing an element having some seven times the strength of hemp. Table 1 is given by Matthews* as a means of comparing the strength of ramie with other commercial fibres in common use. It will be seen that the characteristics of the ramie fibre are taken as 100, those for the other fibres being greater or less according to whether they are better or not for the particular characteristic under consideration. Thus we see that so far as tensile strength is concerned, ramie is by far the strongest, the nearest approach to it being shown by hemp with a tensile strength of only 36 per cent. that of ramie.

We also see from Table 1 that such well-known fibres as silk and cotton possess only 13 and 12 per cent. of this strength, respectively. In view of the greatly increased strengths produced in a finished moulding by the use of cotton as a filler, it would appear that the ramie fibre has a great deal to offer in this direction, particularly so when it is considered that both fibres have the same elasticity. It will be seen, however, that the torsional strength of the ramie fibre is lower than that for either cotton or silk, but as it is somewhat difficult to appreciate any circumstances in which this characteristic has any very pronounced influence under the conditions which we are considering, this comparatively low torsional strength would not appear to be of any great consequence.

Apart from this question of strength, there are other factors which make ramie superior to most of the other vegetable fibres; for example, it is the most resistant to moisture and the fibre is of very good colour, being almost as white as bleached cotton, which characteristic is important where light-coloured fillers are desired. The fibre is, in certain cases, also capable of being separated to very nearly the fineness of natural silk.

The main difficulty which prevents its universal use for the more orthodox purposes, appears to be in the processing of the plant for the separation of the fibre. This is comparatively difficult to accomplish by virtue of the toughness of the tissues in general, in consequence of which it is chiefly decorticated by hand. This would appear to be necessary as the bast of the ramie plant does not respond at all well to a simple aqueous retting process. A comparatively severe mechanical treatment seems to be necessary for the removal of the outer bark, which results in a tough, fibrous tissue consisting of the fibres proper, firmly held together in ribbons by quantities of so-called gum, which has to be chemically removed before the fibres may be extracted.

The more resistant of the gum

* Matthews, "The Textile Fibres" (Wiley and Sons).

This is the NATIONAL PLASTICS MARK . . . .

. . . . . symbolising the quantity production of plastic mouldings. At their Walthamstow Works, British Moulded Plastics Ltd., one of the National Plastics companies, produce radio cabinets, motor car parts, telephone cases, fan housings, electricity meter cases and a host of other mouldings large and small.

Most of these mouldings are made from indigenous raw materials built up into moulding compounds by the British chemical industry. British skill designs the mouldings; designs and makes the moulds. British skill controls the whole process from raw material to finished product. British moulded plastics, made under the National Plastics mark, play their part, week-in, week-out, in the insistent drive for more production.

BRITISH MOULDED PLASTICS LTD.
AVENUE WORKS • WALTHAMSTOW AVENUE • LONDON • E.4

This is one of the VENT-AXIA electric fans. All the plastics parts are moulded by British Moulded Plastics Ltd.

FLY

THERE'S BUSINESS IN THE AIR!

The services of BEA give the manufacturer the chance to keep in close and constant touch with his markets across the Channel. Firms which speed their representatives, samples and tenders by air show that they mean business, besides putting the accent on enterprise at a time when enterprise counts for a 'good deal'

Regular services between Britain and Amsterdam, Ankara, Athens, Berlin, Bordeaux, Brussels, Copenhagen, Frankfurt, Geneva, Gibraltar, Gothenburg, Hamburg, Helsinki, Istanbul, Lisbon, Madrid, Marseilles, Oslo, Paris, Prague, Rome, Stavanger, Stockholm and Vienna

BEA

BEA THE KEY TO EUROPE

BRITISH EUROPEAN AIRWAYS

Reservations and enquiries from all principal travel agents or from Airways Terminal Tel. VICtoria 2323
Headquarters Northolt Middlesex

Stuarts

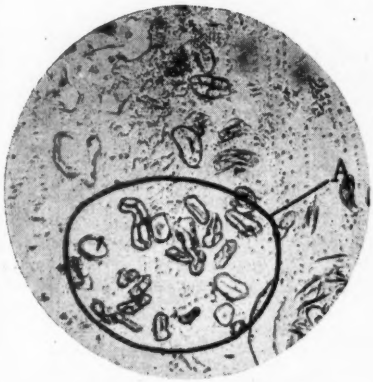


Fig. 201.—Ramie fibres (transverse sections). Mag. 65 diameters.

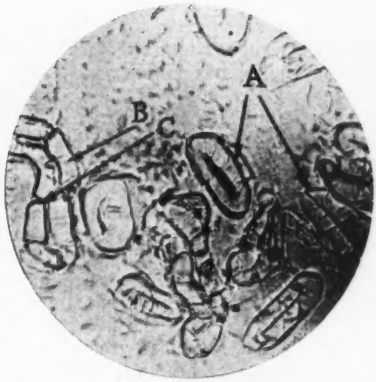


Fig. 202.—Ramie fibres (transverse sections). Mag. 190 diameters.

substances may be removed by treatment with strong alkali solutions under pressure, which breaks up the vasculose and cutose, leaving a small amount of pectose still adhering to the fibre, which in turn can be removed by a mechanical wash. As a result of this treatment a yield of some 10 per cent. degummed fibre is said to be obtained.

So far as its microscopic structure is concerned, the ramie fibre is notable for the large size of its fibre elements, which are anything from 60 to as much as 250 mm. in length, and reach a breadth of 80μ. Thus we see that the average L.B. ratio is of the order of 2400. In tranverse section the fibre is seen in general to be very thick walled, as shown in Fig. 201, this being a photomicrograph of transverse sections of ramie fibres taken at a magnification of 65 diameters. In the group of fibres marked "A" we encounter a varied assortment of shapes and sizes, but in each case the cell wall is seen to be much thicker than those of the other fibres examined so far, and in view of the fact that the fibre appears to contain little or no lignin, this wall may for all practical purposes be considered to be composed of almost pure cellulose, from which it will be seen that in the ramie fibre we have what amounts to a large edition of the cotton fibre, insofar as its chemical constitution is concerned. It will also be noticed in some cases, how the shape is curiously reminiscent of the cotton fibre in transverse section. As a result of this thick nonlignified wall the lumen is seen characteristically flattened and appears as a mere line in the photomicrograph. There are, of course, other differences, such as, for example, the transverse markings in the wall which call for an examination of this material at somewhat closer quarters.

At a magnification of 190 diameters the nature of this fibre is more clearly seen, as indicated in Fig. 202, where it will be noted that the lumen is in reality quite large, in spite of the thick wall. It can well be imagined that when the elements are in the fully expanded condition the cells would be of large diameter both externally and internally; however, in the condition in which they are ready for commercial use they are dry and collapsed in the form shown.

This fibre will be seen to be liberally supplied with what appear to be pit channels traversing the wall, which fact together with the general cross-sectional shape of these elements, such as those shown at "A," also reminds us of the

coconut shell element, but as in the case of the other fibre elements examined there does not appear to be any conclusive evidence pointing to these markings indicating the presence of true pit channels; however, this does not preclude the possibility of their existence.

In the fibre marked "B" there will be seen to be transverse wall markings of a somewhat different character, these would appear to be very deep channels, or, as more probable, fissures in the wall of the fibre. Thus an examination of the marking at "C" would seem to indicate that these fissures are invaginations of the exterior surface of the fibre element producing a longitudinal groove in the outer surface. It would also appear that in some cases there is a corresponding formation of the minor wall surface of the element giving the appearance of a constriction of the wall when seen in transverse section.

These longitudinal grooves will confer useful properties on the fibre, when this latter is considered in relation to its functioning as a filler in a moulding, as the surface resulting from this affords a good key to the resin, presuming the absence of adhesion by any other agency.

The condition is, of course, considerably improved if the presence of pit channels may be taken for granted, but as this latter is a somewhat unwise assumption to make in view of the lack of evidence confirming their existence, the only reasonable certainty we are left with is the existence of the longitudinal fissures or grooves. This would seem to offer the aforementioned advantage over a smooth fibre, particularly so when the fibre is considered in the form of short equal lengths of whole fibre, as against the product obtained by the resolution of the material into its elemental units by chemical treatment, which, apart from the difficulty of attainment in this particular case, produces a material with an L.B. ratio far wider than need be. This would inevitably have its adverse effect on the variability index of the filler, in consequence of which properties in the finished moulding would suffer.

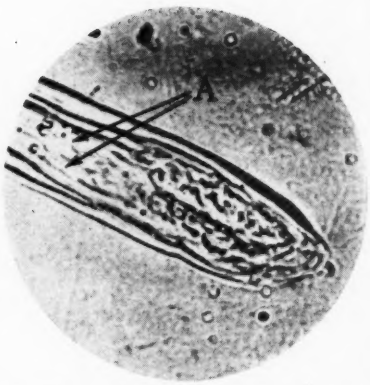
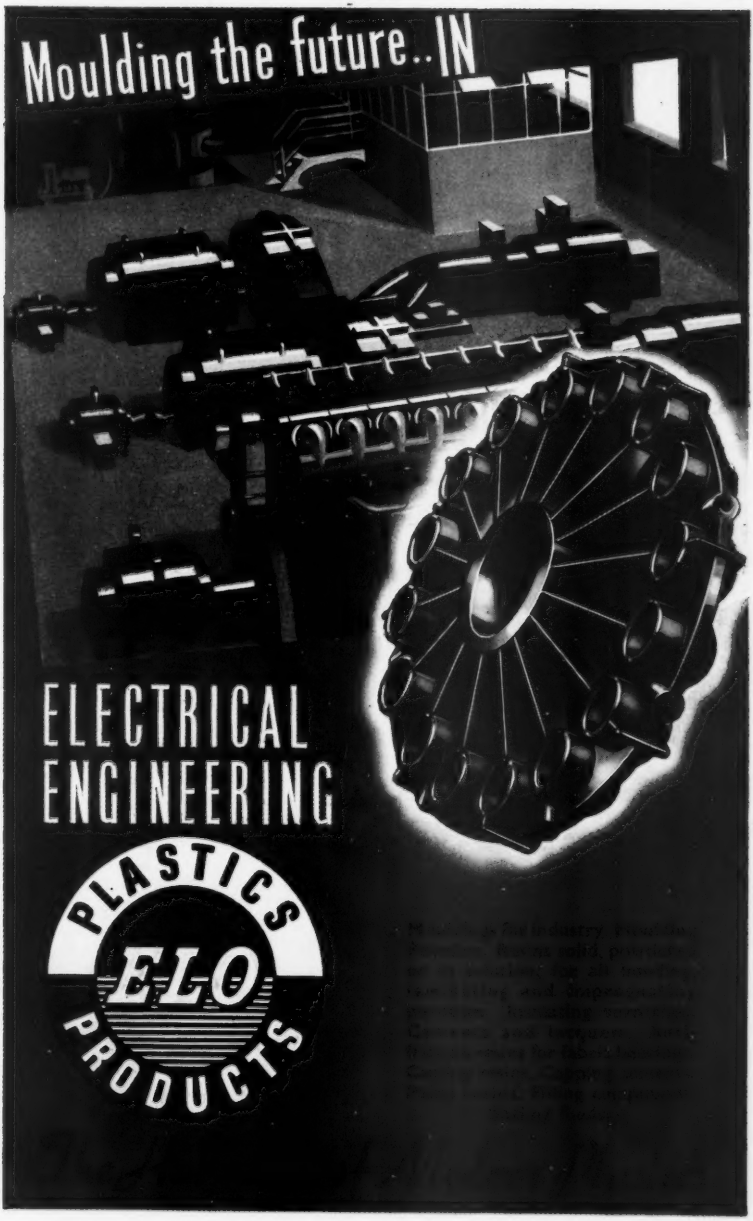


Fig. 203.—Ramie fibre: element tips. Mag. 550 diameters.

The fibre elements themselves are somewhat irregular with regard to outline, although the ends of the cells are fairly regular in shape, but owing to the breadth of the element in cross-section, the element itself is more or less ribbon-like, resulting in a somewhat spatulate end in which the lumen is seen to be very broad when viewed on the flat. We see a typical end of the ramie fibre element in Fig. 203, magnification 550 diameters, from which it will be seen that the wall thickness becomes considerably reduced at the extreme tip, while the lumen becomes correspondingly broader. This particular specimen is illustrated in optical section, as a result of which neither top nor bottom surfaces of the element are in focus, due to the short depth of focus at this magnification; nevertheless at "A" can be seen evidence of two longitudinal grooves in the lower plane of the element wall.

It will be seen that in the mature ramie fibre, the elements consist of long tubular cells with sealed ends, so that if a filler could be obtained consisting of nothing but these elements, the material would consist of a collection of these sealed tubes, each containing a small amount of air. The difficulty of filling these tubes with resin needs no emphasis, as this has been discussed previously. The



Although many ELO Products are in short supply, information on the ELO Organisation is always available.

BIRKBYS LTD., LIVERSEDGE, YORKSHIRE

Translucent
Colourful
MAT
Here is the new plastic for which the trade has long waited. More durable than ever and first in the fashion news because of its smart matt finish, "Craylene" is made in a range of attractive and translucent shades. Ideal for rain-wear, curtains, umbrella covers, bathing caps, etc.
Craylene
PLASTIC

Enquiries to Plastic Section

THE GREENWICH LEATHERCLOTH CO. LTD. DUREX WORKS, ST. MARY CRAY, KENT.

Telephone: Ravensbourne 4674

knowles 103

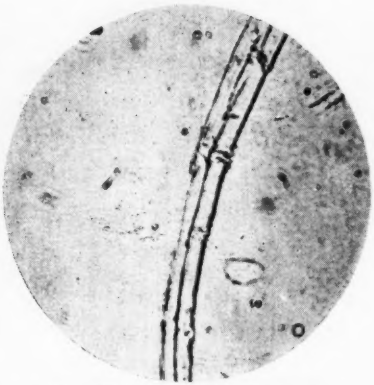


Fig. 204.—Ramie fibre element, showing characteristic cross markings. Mag. 375 diameters.

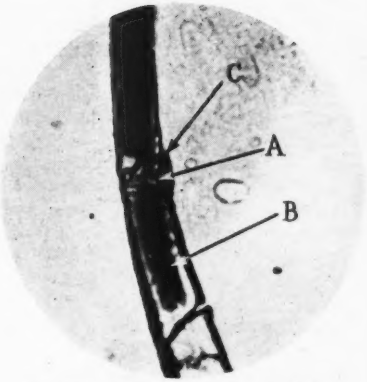


Fig. 205.—Ramie fibre element, showing markings. Mag. 550 diameters. (Polarized light, system open.)

point has, however, been raised again in considering the problem as to whether fibrous materials of this nature are better suited to function as fillers in this form or in the form where the whole composite fibre is cut into very short lengths. It is apparent that the latter procedure would tend to produce a more efficient filling medium which is approaching a true flour in nature and yet which might be expected to confer some of the properties of a truly fibrous filler (i.e., cotton flock, etc.) without the attendant difficulties of incorporating it in the resin.

In continuing our examination of the ramie fibre, it will be noticed at once from a study of the whole element, and the fibre, that the material exhibits the cross markings so typical of the Urticacae very strongly, which is shown in Fig. 204, where evidence of these, now familiar, characteristics is abundantly available. These markings are very strong in numerous cases, even amounting, in many instances, to what appears to be an actual modification or thickening of the cell wall at these places. This effect is well shown when the element is examined under polarized light, and as the fibre is very strongly anisotropic, due to the absence of lignin, the marks are made clear with an open system as seen by the photomicrograph in Fig. 205, showing some of these markings at 550 diameters under these conditions of illumination. Thus the marking at "A" will be clearly seen to form a "criss-cross" pattern of ridges across the direction of the long axis of the element, this being so strong as to result in a thickening of the wall of the element as evidenced by the portion marked "C."

It has been previously suggested that these markings might possibly be due to a type of lignin thickening, as the fibres are obtained from the strong stem tissue in which lignin was usually found to be present. However, in view of the fact that the ramie fibre has no detectable lignin in its constitution and yet possesses these markings, it is probable that these latter are the result of mechanical forces existing during the growth of the element, also previously suggested. If we assume that such is indeed the case, and also bearing in mind that the marks in the ramie fibre are the strongest so far encountered, it would appear very much as if the occurrence of lignin in the cellulose actually possesses some kind of inhibitory action

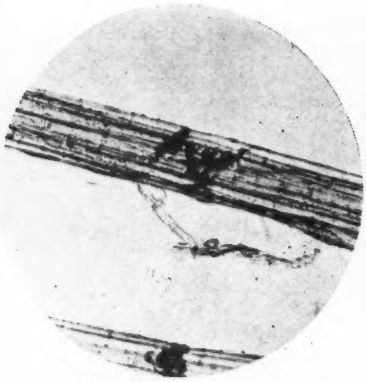


Fig. 206.—Ramie fibre : transverse markings as seen by transmitted light. Mag. 65 diameters.

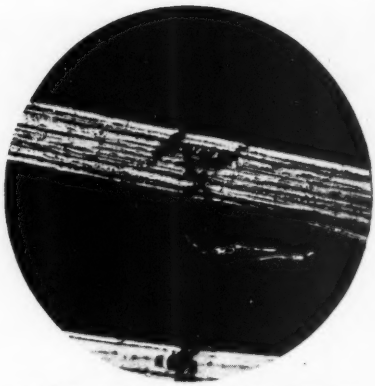


Fig. 207.—Ramie fibre showing transverse marks, under polarized light, system crossed. Mag. 65 diameters.

on the development of these so-called markings. By way of interest it will be noticed that the element under consideration is viewed from the side as it were, as shown by the lumen appearing as a mere line, as at "B."

This apparent thickening of the wall does not occur in all cases of markings as there are others which appear to consist of a modification of the substance of the wall, inasmuch as that they appear darkly coloured or even black when seen by transmitted light, as shown in Fig. 206, where we see a whole fibre possessing this type of mark, magnification 65 diameters. The fibre itself is made up of several elements, and, as we have already seen, the marks originate in the elements and produce this appearance en masse. The extreme density of the mark is noteworthy and gives an impression of heavy pigmentation which may or may not be the case, but whatever the nature of this phenomenon it seems reasonable to assume that marks of this type are different in nature from those just discussed, resulting in a local thickening of the wall.

At the same time it would appear as if these markings are of a different origin, for there does not seem to be any accompanying high stress area in the cellulose, either at the point of the mark or in the immediately surrounding areas, as was demonstrable in previous cases by the use of polarized light. When this particular type of mark is examined in this way, the fibre, as is to be expected, exhibits strong birefringence, but at the mark there is no sign of this, for the mark appears to be exactly the same as when viewed by ordinary transmitted light. This is well illustrated in Fig. 207, which is a photomicrograph of the same mark as in Fig. 206 under the same conditions of magnification, the only difference being that in Fig. 207 the specimen is illuminated by polarized light and in a crossed system so that the fibre is seen to be strongly birefringent, while the mark does not appear to exhibit any change whatsoever.

It has been previously pointed out that any substance exhibiting birefringence does so by virtue of the existence of intermolecular stress in its structure, thus highly oriented substances are strongly anisotropic, while those showing little or no orientation, such as lignin, show little if any birefringence and are therefore classed as isotropic. In this condition they do not appear self-luminous when examined in a crossed

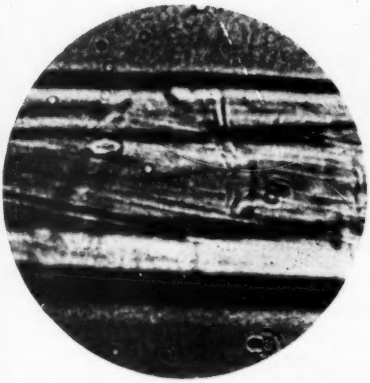


Fig. 208.—Ramie fibre element showing micelle spirals. Mag. 700 diameters.

polarizing system, but it was also mentioned that whereas isotropic substances were relatively few in number, they all exhibit birefringence when subjected to strain in one or more directions.

It would appear, therefore, to be of great interest as to whether all substances are fundamentally isotropic in nature and occur in such forms possessing orientation or inherent stress, making them anisotropic in the main, or whether anisotropy is fundamental and isotropy incidental. Some small measure of support is given to the former conjecture by the fact that unoriented regenerated cellulose is not birefringent unless subjected to stress of some sort.

In view of these remarks the effect exhibited by the mark in Fig. 207 is capable of being explained in two ways. First, it might possibly be due to the existence at this point of a stressless region in the cellulose, but if this were the case it is difficult to visualize the boundaries of this portion being as sharply defined as they are in the illustration. The transition from the one condition to the other would rather be expected to be gradual, or at least passing through some intermediate state.

The ramie fibre, as may be expected, exhibits strongly the phenomenon of spiral orientation of micelle bundles. This is well seen in Fig. 208, which is a photomicrograph of the top surface of an element at 700 diameters. The spiral effects of the micellar orientation may be quite easily distinguished; it will be noticed that the angle in this case is somewhat different from that in the fibres previously examined. This structure in natural fibres is of great interest when considering them as potential fillers, because it would appear that certain solvents are capable of penetrating the very fabric of the cell wall itself; however, this will be further discussed subsequently, for the time being it is necessary only to remark on its existence as being more or less characteristic of all natural cellulosic fibres.

(To be continued.)

CELLULOSE ACETATE PLASTICS

(Continued from page 432)

the most popular method would appear to be the "cracking" of acetic-acid vapour by passing through heated tubes over a catalyst. This converts the acid mainly to ketene, which is then converted to acetic anhydride by treatment with acetic acid in a scrubbing device. Many other methods are described in the patent literature, but the ketene method is usually regarded as the most efficient and practical.

$$CH_3COOH \longrightarrow CH_2{=}CO + H_2O$$

Acetic acid —> Ketene

$$CH_3COOH + CH_2{=}CO \longrightarrow CH_3CO{-}O{-}COCH_3$$

Acetic acid + Ketene —> Acetic anhydride

It can be seen from these brief notes that the three major materials for the preparation of cellulose acetate can be derived potentially from a large number of widely differing sources. This fact should eventually give acetate a great advantage over many other plastics, which are often confined to one or two major raw materials. A simplified scheme, showing the potential sources of cellulose-acetate raw materials, is given in the accompanying flow-sheet.

(To be continued)

PLASTICS IN GERMANY

(continued from page 426)

exposure to gas attack. The films were made by casting a solution of the polyamide on an endless copper band, with subsequent stripping. The polyamide comprised an interpolymer of 60 per cent. of an adipic acid (hexamethylene diamine resin) and 40 per cent. of an amino-caprolactam polymer in an organic solvent.

FIAT Final Report, No. 762.—New plastics for German aircraft (structural materials, glazings and paints) are briefly surveyed. A promising idea on gluing with phenolic resin was that, if the glue "set" without coagulation, a better bond was produced than if the glue coagulated into tiny globules. This coagulating condition seemed to be a function of pH, water content of the glue, and the degree of condensation.

Index to Advertisers

	Page
Almex, Ltd.	lvi
Ashdowns, Ltd.	iv
Bakelite, Ltd.	xxxvi
Barber & Duffy, Ltd.	xlviii
Baynes, Charles, Ltd.	lviii
B.G. (London), Ltd.	xxviii
B.I.F.	xiv
Birkby's, Ltd.	xlv
Blackfriars Engineering Co., Ltd.	xlix
Blagden, Victor, & Co., Ltd.	xxii
British European Airways	xliv
British Gas Council	viii
British Industrial Plastics, Ltd.	xlvii
British Institute of Plastics Technology	lii
British Moulded Plastics, Ltd.	xliii
Butcher, Henry, & Co.	lvi
BX Plastics, Ltd.	Front Cover
Byson Appliance Co., Ltd.	lxvi
Catalin, Ltd.	Inside Back Cover
Chamberlain & Willows	lx
Cohen, George, Sons & Co., Ltd.	vi
Cole, R. H., & Co., Ltd.	xxv
Collis, J., & Sons, Ltd.	v
Cornercroft (Plastics), Ltd.	xxxiv
Courtaulds, Ltd.	lii
Crystalate, Ltd.	xxviii
Delapena & Son, Ltd.	xxvi
Derwent Plastics, Ltd.	xvii
Desouter Bros., Ltd.	xxi
Dohm, Ltd.	lix
Dominion Export Co., Ltd.	l
Duraplex (Plastics), Ltd.	xiv
Duratube & Wire, Ltd.	xvi
Erinoid, Ltd.	Back Cover
Ether, Ltd.	lviii
Evans, Frederick W., Ltd.	xlviii
Ferguson, James, & Sons, Ltd.	xlii
Ferodo, Ltd.	iii
Firth, Thos., & John Brown, Ltd.	xv
Firth-Vickers Stainless Steels, Ltd.	xxxiv
Fisher & Ludlow, Ltd.	liv
Flextol Eng. Co., Ltd.	xxx
Frenkels Machines (Gt. Britain), Ltd.	x
Galea, G.	xlviii
Gardner, Wm., & Sons (Gloucester), Ltd.	xl
Gee, William, Ltd.	xviii
General Electric Co., Ltd., The	xxix
Gosheron, John, & Co., Ltd.	l
Greenwich Leathercloth Co., Ltd., The	xlvi
G.R.L. Plastics, Ltd.	liv
Haigh, John, & Co., Ltd.	lvi
Harris, Alfred	l
Heeley Silver Rolling Mills, Ltd.	xxiv
Hollins Mills Co., Ltd., The	liv
Imperial Chemical Industries, Ltd.	xxxix
International Combustion, Ltd.	xxvii
Interscience Publishers, Ltd.	lii
Jones, E. H.	xxxii
Jones, Samuel, & Co., Ltd.	xxiv
Kayser, Ellison & Co., Ltd.	xxiii
Kent Mouldings	lv
Kenure, J. F., Ltd.	lxvi
Law, F.W., & Sons, Ltd.	lviii
Londex, Ltd.	lviii
McArd, Robert, & Co., Ltd.	xi
M.C.L. and Repetition, Ltd.	lvi
Micanite & Insulators Co., Ltd., The	xli
Midland Industries, Ltd.	xx
Ministry of Fuel and Power	ii
Ministry of Supply	lxi
Monsanto Chemicals, Ltd.	xxxvii
Moulded Products, Ltd.	xx
National Savings	lxi
New London Manufacturing & Plating Co., Ltd.	lvi
Office Appliance Trades Association	xlix
Page, W., & Sons	lx
Peace, Harold E., & Co., Ltd.	liv
Plastics Specialities, Ltd.	lii
Potts Engineers, Ltd.	lvii
Proved & Producing	lxvi
Punfield & Barstow, Ltd.	liii
Raymond, Mark	l
Reed Bros. (Engineering), Ltd.	xvi
Reliance Trading Co.	lx
Richard & Hopkins, Ltd.	xlviii
Rootes Mouldings, Ltd.	lvii
Rubber Improvement, Ltd.	xxxviii
Runbaken	lx
Schori Metallising Process, Ltd.	xxii
Sellotape	lix
Shannon, Ltd., The	xxx
Static Condenser Co., Ltd., The	xviii
Steele & Cowlishaw, Ltd.	lx
Sterling Rubber Co., Ltd.	lxvi
Sunvic Controls, Ltd.	li
Synchronome Co., Ltd., The	xlviii
Tenaplas, Ltd.	xxxi
Terry, Herbert, & Sons, Ltd.	vii
Toolmakers & Designs (Coventry), Ltd.	xlviii
Trapinex, Ltd.	Inside Front Cover
Tullis Russell & Co., Ltd.	xiii
Turner Bros. Asbestos Co., Ltd.	lv
Turner Mfg. Co., Ltd.	xix
U.K. Plastics, Ltd.	ix
United Ebonite & Lorival, Ltd.	i
United Plastics & Chemicals (London), Ltd.	xxxv
Universal Tools, Ltd.	xxxii
Utilex, Ltd.	liii
Visco Engineering Co., Ltd.	li
Wall Paper Mfrs., Ltd., The	lx
Wiggins Teape & Alex Pirie (Sales), Ltd.	xxxiii
Wilkinson Rubber Linatex, Ltd.	xii

Leaves from a Moulder's Notebook

This is the ninth in a series of notes by the B.I.P. Development Department on the problems of the moulder and designer. B.I.P. will send a copy of previous notes on request and will welcome comments and enquiries.

Air Vents

Compression mouldings containing such features as deep ribs or bosses have always been prone to shorts, and this is one of the reasons why the transfer method of moulding might be adopted in such cases.

Another type of compression moulding having a deep draw, as for instance a deep cylindrical article with a depth two or three times its diameter, will be subject to eccentricity due to the flexing of the punch within its elastic limit during moulding. Such articles are for this reason often moulded upside down using the "displacement" method, which will cure eccentricity but may introduce trouble due to shorts.

In the transfer moulding of extremely complicated articles and even in cases of some simple ones, shorts or porosity opposite to the feed is a third headache for the moulder.

The flow of material to inaccessible or distant parts of the mould will be restricted and reduced in speed by wall friction, and when no escape is permitted, air will be trapped before the flowing bulk of material, causing shorts or porosity.

In almost all cases the use of air vents can provide a remedy. Figs. 1 to 3 illustrate air venting methods which have been applied with success to the three cases mentioned above. If the back taper particularly in compression moulds is correctly proportioned and clearance space for escape material sufficiently large, the air vents will clear themselves at the closing stroke of each moulding cycle.

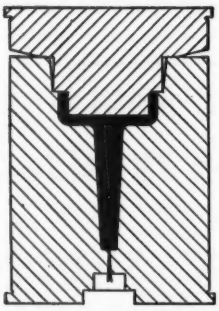


FIG 1. COMPRESSION MOULD.

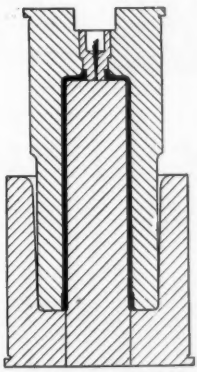


FIG 2. DISPLACEMENT MOULD.

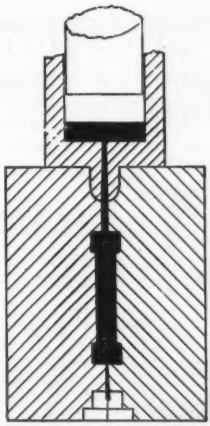


FIG 3. TRANSFER MOULD

BRITISH INDUSTRIAL PLASTICS LTD.
1 ARGYLL STREET · LONDON · W.1
B·I·P GROUP

P.V.C. EXTRUDED

Durastrip

PIPING. SLEEVING. BRAIDS

Wide range of designs and colours from stock.

OFFICIAL LONDON STOCKISTS TO DURATUBE & WIRE LIMITED NON-TECHNICAL DIVISION

RICHARD & HOPKINS LTD.

31, THEOBALDS ROAD, LONDON, W.C.1

Telephone: HOLBORN 2736-7

George Washington

COULD HAVE TOLD A LIE... if he had tried, but it is impossible for the Synchronome Electrical Impulse Clocks to do so. They do not depend on the Electricity Supply for their timekeeping or for their continuity of operation. They are installed all over the world and the Master Clock embodies the fundamental principles of the Free Pendulum installed at Greenwich Observatory by the Synchronome Company which has held the world's timekeeping record since 1925.

Supplied on rental terms including full maintenance or can be purchased outright. Write for full technical details of the 'SYNCHRONOME' Clock and time recording systems for Factories, Offices, Public Institutions, Schools, etc.

but SYNCHRONOME CLOCKS *cannot!*

THE SYNCHRONOME CO., LTD.
ABBEY ELECTRIC CLOCK WORKS
WOODSIDE PLACE, MOUNT PLEASANT, ALPERTON, WEMBLEY.
Telephone: WEMbley 3643.

Pioneers! in MOULDS for MODERN PLASTICS also Press Tools, Jigs and Gauges.

BARBER & DUFFY LTD

214/222, Cardigan Road, LEEDS,
Telephone: LEEDS 52033

Member of the Gauge and Toolmakers' Association.

PLASTIC MOULDINGS AND CASEIN TURNINGS

To your particular requirements

FREDERICK W. EVANS, LTD.
PLASTIC WORKS, LONG ACRE, BIRMINGHAM 7.

TELEPHONE:—EAST 1286 and 1287.

TOOLMAKERS & DESIGNS (Coventry) LTD.

BRAYS LANE, COVENTRY. Telephone: COVENTRY 4051/2.

TOOLMAKERS TO THE ENGINEERING AND PLASTICS INDUSTRIES

The foundation of success in mouldings rests on first-quality Moulds. Our reputation ensures first-class returns to our clients. Repeat orders prove it! We design and manufacture compression-transfer-injection moulds of highest quality and finish. Jigs, fixtures, gauges, press tools, special-purpose machines, etc. Limited capacity also available for high-class batch production work.

Let US have YOUR enquiries for "that" job.

BUSINESS EFFICIENCY EXHIBITION

for better management in office and factory

Empire Hall, OLYMPIA, London
October 1 — October 11, 1947

Organised by the Office Appliance Trades Association of Gt. Britain and Ireland, 11-13 Dowgate Hill, Cannon Street, London, E.C.4.

OPEN from 10 a.m. - 8 p.m. daily (Except Sunday)

FOR
GRINDING PLASTICS
USE

The MASSON ROTARY CUTTER

The Masson Rotary Cutter reduces all kinds of Plastic materials and synthetic rubber to uniform granules with freedom from dust. Any degree of granulation obtainable. LOW H.P. HIGH OUTPUT.

BLACKFRIARS ENGINEERING COMPANY LTD.
BLACKFRIARS HOUSE · NEW BRIDGE STREET · LONDON · E.C.4 · Central 6383

AGENCIES WANTED for AUSTRALIA

● The Managing Director of this well-established firm is visiting England early in 1948 and wishes to contact progressive English and Continental manufacturers of all classes of goods, including Products made from Plastics; Products used in the Plastics Industry; Partly Manufactured Goods, etc.

This widely experienced organization covers every State of the Commonwealth.

Write immediately per air mail to

MARK RAYMOND

EXPORTERS, IMPORTERS, INDENTORS, FACTORY REPRESENTATIVES

Temple Court, 422, Collins Street, Melbourne, Australia

Plastic Moulding Materials

FOR INJECTION & COMPRESSION MOULDING

PHENOL FORMALDEHYDE
UREA FORMALDEHYDE
MELAMINE FORMALDEHYDE

CELLULOSE ACETATE, BUTYRATE
ETHYL CELLULOSE, ACRYLICS
POLYSTYRENE, POLYETHYLENE

Virgin and First Grade Materials available for early delivery. Full specification and terms, etc., on application to:

MATERIAL DEPT.

DOMINION EXPORT CO. LIMITED

11, Oxford Circus Avenue, London, W.1

'Phone: Gerrard 2931 'Grams: Stepla, London

RAW MATERIALS FOR PLASTICS & LACQUER INDUSTRIES

NITRO CELLULOSE SOLUTIONS
NITRO CELLULOSE in all forms
CELLULOSE ACETATE in all forms
POLYSTYRENES
POLYTHENE, etc.
PERSPEX SCRAP

Samples and technical information gladly on request

ALFRED HARRIS & CO. LTD.

Reclaimers and Refiners

TOWNSHEND TERRACE, RICHMOND

Telephone: Richmond 0028-9, Surrey

What is it

that aids
identification
simplifies grouping
assures accuracy
provides safe
attaching and
speeds movement?

It's

TRANSOTAPE

self-adhesive cellulose tape

May we send you specimen roll?

John Gosheron & Co Ltd

GAYFORD ROAD LONDON W12

Dust Collection

means Cleaner and Healthier Factories

Safeguard workers who operate grinding, polishing or linishing machines engaged on plastic, or metal, materials from the ills arising from inhaling dust given off at these tools. Fit each machine with the "Visco" Dust Collector illustrated and keep the atmosphere around the machine free from dust. Dust freed from the wheels during grinding or polishing is drawn *into* the Unit and away *from* the worker. We have several models, one of which will solve your dust problem. Ask for publication 469.

VISCO
ENGINEERING CO. LTD.
STAFFORD ROAD. CROYDON

Is YOUR VOLTAGE all over the place?

Why not make your process heaters independent of voltage fluctuations?

The Energy Regulator maintains constant input to heaters despite normal or abnormal variations of voltage.

Prevent spoilt batches by fitting Energy Regulators in place of control resistances. The Type ER.3 unit controls up to 3.5 kW. at 230 V. A.C. or D.C.

Full details in publications R.12/51 and ER.10/51. WRITE NOW!

SUNVIC CONTROLS LTD.
Stanhope House, Kean Street, London, W.C.2

SUNVIC

TAS/SC167

Just Published

PHENOPLASTS

Their Structure, Properties and Chemical Technology

By T. S. CARSWELL

Manager, Research and Development Departments, Commercial Solvents Corporation, Terre Haute, Indiana

(Vol. VII of the Series "High Polymers")

Until recently the manufacturing technique of phenol-formaldehyde and allied resins was far ahead of the theory behind the amazing industrial achievements. But the study of the physical and chemical properties of plastics has made great advances in recent years. The results are collected in Carswell's book which will help in clarifying existing conceptions and will stimulate further investigations which should lead to the development of new techniques and tools.

279 pages
85 illustrations

33/-

INTERSCIENCE PUBLISHERS
LIMITED
2a, SOUTHAMPTON ROW, LONDON, W.C.1

moulding powders

POLYSTYRENE
ETHYL CELLULOSE
CELLULOSE ACETATE
UREA FORMALDEHYDE
MELAMINE FORMALDEHYDE
PHENOL FORMALDEHYDE

We can offer early shipment from U.S.A. Delivery c.i.f. U.K. port. Dollar payment against irrevocable letter of credit in New York. Import Licences obtainable if finished goods intended for export or essential services.

Enquiries promptly attended to:—

PLASTIC SPECIALITIES LTD.
9, Belgrave Road, S.W.1

Telephone - - - - - VICtoria 6071/2
Telegrams - - "PLASTIAL SOWEST," London

OPPORTUNITIES IN PLASTICS

A most informative handbook entitled **"OPPORTUNITIES IN PLASTICS"** is now available for distribution. This guide discusses in considerable detail the prospect of careers in all branches of the Plastics Industry—knowledge required, salaries, possibilities of promotion, and so on—and explains how you may prepare for these opportunities through our modern home-study courses.

We specialise in Plastics training and our courses are authoritative, up to date and comprehensive. The range of our tuition is wide, covering **Elementary Instruction in Basic Subjects, PLASTICS TECHNOLOGY**, coaching for the **CITY AND GUILDS EXAMINATIONS**, and specialised instruction in such specific branches of the industry as:—

Plastics Mould Design, Plastics in the Paint, Varnish and Lacquer Industries, Plastics Costing and Estimating, Plastics for the Aircraft Industry, Plastics for the Electrical Industry, Plastics for the Building Industry, Plastics in Sales Promotion, Plastics in Textiles, Designing in Plastics, Synthetic Rubber Technology, etc.

All courses are conducted under a guarantee of
"SATISFACTION OR REFUND OF FEE"

"OPPORTUNITIES IN PLASTICS" will be sent on request, free and without obligation. The book contains so much useful information and guidance that whatever your interest in plastics may be, you should make a point of writing for your copy at once.

BRITISH INSTITUTE OF PLASTICS TECHNOLOGY
2, Shakespeare House,
17, Stratford Place, London, W.1

Courtaulds
LIMITED

MOULDING POWDERS
SHEETING
TUBING
FILM
MADE FROM
CELLULOSE ACETATE

REGISTERED TRADE MARK

Plastics Division
Foleshill Road, Coventry. *Telephone: Coventry 88771*

UTILEX

UTILEX
T RANSPARENT CELLULOSE ACETATE.
I NSULATING.
L IGHT.
E XCEPTIONAL IN CLARITY.
X CELLENT IN QUALITY

SHEETS, FILMS, MOULDING POWDER AND RIGID TRANSPARENT CONTAINERS.

UTILEX LIMITED,
MILL STREET, KINGSTON-ON-THAMES.
Telephone: KINGSTON 1660.

We supply the Trade ONLY. Injection mouldings made to their specifications. Send us your enquiries and we shall be pleased to quote you if we are not already manufacturing competitive lines.

YOU CAN RELY ON

PUNFIELD & BARSTOW
(MOULDINGS) LTD.

BASIL WORKS · WESTMORELAND ROAD · QUEENSBURY · LONDON, N.W.9
'Phone: COLindale 7160 & 7956 'Grams: Punfibars, Hyde, London

FOR INJECTION MOULDINGS

FINEST QUALITY
PLASTIC
P.V.C.
SHEETING

IN EVERY VARIETY OF COLOURS, INCLUDING METALLIC SHADES, TRANSLUCENT AND PRINTED SHEETS

GRL *plastics* LIMITED

58, FINSBURY PAVEMENT, LONDON, E.C.2. TEL: MON 9737
TELEGRAMS: ELGARCON, AVE., LONDON

"Holly" Brand
TEXTILES
FOR
PLASTICS
are produced by
THE HOLLINS MILL CO. LTD. MARPLE
CHESHIRE
All Enquiries and Correspondence to
5, PORTLAND ST., MANCHESTER, 1

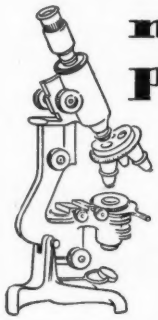
The **PERMANENT WAY** *to mark your products!*

HAROLD E. PEACE & CO. LTD.
LUDGATE HILL & WATER ST., BIRMINGHAM 3.

KEEP THINGS MOVING —

FLOWLINE **YOUR OUTPUT**

Whatever you are packaging, transporting, assembling or processing, remember it's "faster on a Flowline." The Flowline Standardised Conveyor System is mechanical handling in its simplest, most efficient, and most economical form. Write for FLOWLINE Handbook: Fisher & Ludlow Ltd., Gridway Division, Dept. 9, 110/111 Strand, London, W.C.2. 'Phone Temple Bar 2755.



mouldings to precision limits

KENT, fine-limit, moulding is opening up a new medium for the precision engineer—wherever plastic components of high accuracy are demanded, there will you find the mouldings of KENT.

KENT MOULDINGS
Footscray, Kent
Telephone: Footscray 3333

For mouldings that matter

DURESTOS REGISTERED

THE HIGH STRENGTH ASBESTOS MOULDING MATERIAL

has high resistance to acids and chemicals

"Durestos" is a new asbestos-based material for making plastic mouldings of exceptionally high strength and dimensional stability, and in the RA.3 grade, strongly resistant to most reagents. Highly suitable for gears, moulded containers and trays for batteries, chemical vats and vessels, packings, bearing bushes and many other applications in the chemical and engineering industries. Full particulars on request.

TURNER BROTHERS ASBESTOS COMPANY LIMITED, ROCHDALE

AF.3

HAIGH'S

for STEARINES

Supply shortages have compelled us to reduce appreciably the number of grades of Haigh's Stearines. Even so we maintain a range sufficient to meet your requirements, and you can always rely on a good product backed by helpful service.

Please let us know your usage, and we will submit samples.

JOHN HAIGH & CO. LTD.
CLAYFIELD OILWORKS
SLAITHWAITE - YORKS
Telephone : Slaithwaite 266/267

HOS.3

ALMEX LIMITED

78-82, EXCHANGE BUILDINGS, STEPHENSON PLACE, BIRMINGHAM, 2.
Phone: Midland 0682.

CUPREX LIMITED
Finsbury Pavement House, 120, Moorgate, London, E.C.2.
Phone : Metropolitan 9641.

ALMEX LIMITED
26, Corporation Street, Manchester, 4.
Phone: Blackfriars 0301.

Stockists of **I.C.I. "PERSPEX" ACRYLIC SHEETING** and **I.C.I. "CRINOTHENE"**

We undertake the cutting and edge polishing of **"PERSPEX"** sheeting to customers' requirements.

We can also **DYE** your **"PERSPEX"** sheets or finished articles to any required transparent colour.

We supply **CELLULOSE ACETATE** and **POLYSTYRENE** injection moulding powders for quick delivery for use on export goods only.

P.V.C. and **POLYTHENE** available for home trade.

BARRELS

to the specific requirements of our customers

Makers of all types of repetition products from the bar in all metals

M.C.L. AND REPETITION LTD
POOL LANE, LANGLEY, BIRMINGHAM

HENRY BUTCHER & CO.

AUCTIONEERS, VALUERS and SURVEYORS

Specialising in the Valuation and Sale of FACTORIES, PLANT and MACHINERY

73, Chancery Lane, London, W.C.2
TEL.: HOLBORN 8411 (5 lines).

METER DIALS AND SCALES

In order to cope with the demand for Meter Dials and Scales, we have extended our production facilities.
Your enquiries will receive our immediate and careful attention.
We are in a position to give prompt deliveries for urgent orders.

NEW LONDON MANUFACTURING & PLATING CO. LTD.
NEWLON WORKS - STANLAKE ROAD - LONDON - W 12
'Phone : SHEPHERD'S BUSH 2978.

SPECIALITY EQUIPMENT
FOR THE PLASTIC INDUSTRY
IS NOW IN
FULL PRODUCTION

POTTS
ENGINEERS TO THE PLASTIC INDUSTRY

IF YOU HAVE ANY PROBLEMS SEND THEM TO US

Early deliveries can now be quoted for the following: Die-casting Dies ★ Moulds for Plastic Materials ★ Steel Brands, Stamps, Nameplates, Metal Checks, Labels, etc. ★ Die-sinking and Engraving Work ★ Jigs and Fixtures—Special Machines, etc. All enquiries promptly dealt with!

POTTS ENGINEERS LTD.
FIRTH TERRACE, NEWTOWN, LEEDS
Telephone: LEEDS 23522

RM
SERVICE and DEPENDABILITY

Plastic Mouldings of all descriptions

ROOTES
Mouldings Ltd
SLOUGH, BUCKS Telephone: Slough 22349

ETHER

THERMO - COUPLE

SURFACE CONTACT PYROMETERS

Ether pyrometers used for measuring platen temperatures, automatically controlling injection moulding machine temperatures. A full range of instruments covers every requirement of the plastic industry.

ETHER LTD

TYBURN RD., ERDINGTON, B'HAM, 24

TELEPHONE: EAST 0276/7

SUPPLIES FROM STOCK

CASEIN

SHEETS RODS TUBES

CATALIN CAST SYNTHETIC RESIN

SHEETS, RODS, TUBES, PROFILE SHAPES

P.V.C.

Sheeting 48" wide—6/8 thou thick
16" x 20"—30-35-40 thou thick

CELLULOSE ACETATE SHEET

from 0.05 to 7 m/m. thick,
Opaque and Transparent

"CRINOTHENE"

Acetate Sheets for Lampshades—
all colours

CELLULOID

"PERSPEX" BRAND ACRYLIC RESIN SHEETS

from 1/24" to 1" — Clear and Clouded

EBONITE

SHEETS RODS

MOULDING & INJECTION POWDERS

GILBERT GALEA

MERCHANT IMPORTER-EXPORTER

Established 1918

Dominion House,
Bartholomew Close, London, E.C.1

Phone: MONarch 3994 & 6770
Grams: Gilgalbert, Cent, London

LONDEX
PROCESS TIMERS

Synchronously driven and condenser charge/discharge Timers. Automatically self-resetting and hand-resetting types for controlling all kinds of industrial processes, plastic presses, chemical actions, welding, etc.

Ask for leaflets PT/PL

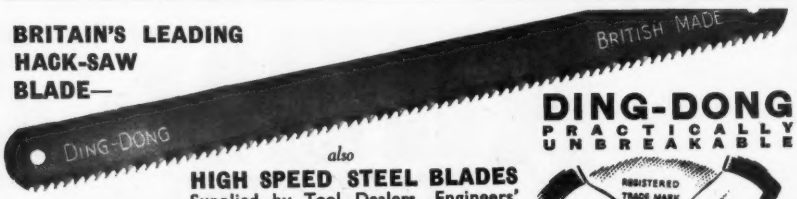
LONDEX LTD MANUFACTURERS OF RELAYS
207 ANERLEY ROAD LONDON S.E.20 SYDenham 6258-9

FOR RUBBER AND PLASTIC DIES OR MOULDS — AND SPECIAL MACHINES

the name is **LAW** *for the rapid execution of your* **ORDER**

F. W. LAW & Son Ltd.
CASTLE WORKS,
MANCHESTER ROAD, ROCHDALE.
TELEPHONE: ROCHDALE 3002.

BRITAIN'S LEADING HACK-SAW BLADE—



DING-DONG
PRACTICALLY UNBREAKABLE

also

HIGH SPEED STEEL BLADES
Supplied by Tool Dealers, Engineers' Merchants, Mill Furnishers, etc.

Manufactured by :—

CHARLES BAYNES LTD.,
KNUZDEN BROOK, BLACKBURN.

Expand quicker...

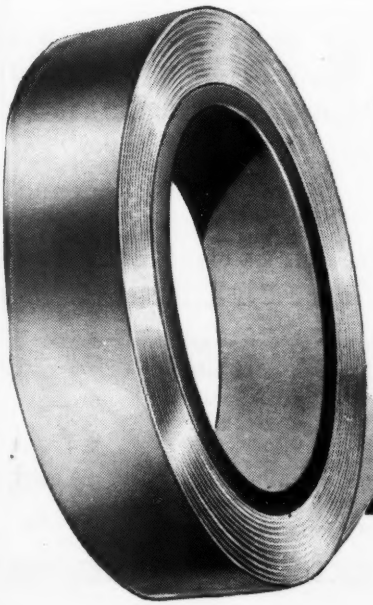
Use our plant and experience— Six factories for pulverising, mixing and grading of raw materials. We may introduce improved methods and materials.

DOHM LTD

167 VICTORIA ST.
LONDON, S.W.1

Telephone:
Victoria 1414/5/6
and Victoria 7913

SIX FACTORIES



clear or coloured
transparent or opaque
plain or printed

SELLOTAPE solves the trade moulder's difficult problem of counting and grouping an infinite variety of mouldings of different shapes and sizes for packing and despatch. No more bothersome discrepancies to aggravate customers and harass overworked staffs. Let us show you how SELLOTAPE can serve you in this and other ways . . . No obligation, of course.

GORDON & GOTCH LTD.

Dept. PL. 4, 75/79, Farringdon Street, London, E.C.4.

Sellotape

SELF-ADHESIVE CELLULOSE TAPE

Mica Lubricant and Filler . . .

N.S.S.A. Steam-water Ground Mica is a white paper filler and lubricating coating for other fillers to enhance their flow and thermal and electrical insulating properties.
Use as filler in paper to be coated with resin or varnish, then build up and press, roll or mould.
Coat ordinary mica powder with N.S.S.A. and then use as a filler for moulding powders to make them heat resisting and more reliable electrical insulators. Ideal filler for Plastic moulding powder and rubber.

Samples and Prices on Application
Technical Data

The Wall Paper Manufacturers Ltd.
MICA BRANCH
GRESHAM RD., OSMASTON RD., DERBY

Telegrams: MICABRANCH, DERBY
Telephone: DERBY 45761

STEEL-SHAW
PEBBLE MILLS

For the grinding of all kinds of Powders, Chemicals, Minerals, Colours, Paints, Enamels, etc. Supplied lined with hard Porcelain, Silex or special linings, and can be insulated to suit particular classes of work.

Send for our free illustrated literature.

STEELE & COWLISHAW, LTD., *Engineers*
(Dept. No. 27). **COOPER STREET, HANLEY, STOKE-ON-TRENT.**
London Office: 329, High Holborn, W.C.1.
Telephone: Holborn 6023.

Nearly ½ a Century's Experience in Grinding

WANTED—STOCKS for CASH

WE are cash buyers of merchandise of every description. Also Clearance Stocks, Discontinued Lines, Surplus Stocks; in fact, goods of all kinds can be disposed of through us, without delay, on the most favourable terms, and without trouble.

SHOULD you have anything for disposal, either now or at any future time, please send us samples, full particulars and price on a cash settlement basis.

RELIANCE TRADING COMPANY
Wholesale Warehousemen and General Merchants
13, New College Parade, Finchley Rd., London, N.W.3

W. PAGE & SONS
PACKAGING SPECIALISTS

ALL SIZES OF NEW AND ONCE USED CARTONS SUPPLIED FROM STOCK

Please see our advertisement in classified columns for full details.

34, LANGSIDE CRESCENT, SOUTHGATE, N.14. *PALMERS GREEN 5087 & 9916*

THE VALUATION OF FACTORIES PLANT & MACHINERY
for
Capital Issues, Balance Sheet, Insurance Cover, Sale or Purchase.

A SPECIALISED SERVICE
offered by
CHAMBERLAIN & WILLOWS
INDUSTRIAL PROPERTY SPECIALISTS
23, MOORGATE, LONDON, E.C.2.
CITy 6013 (6 lines).

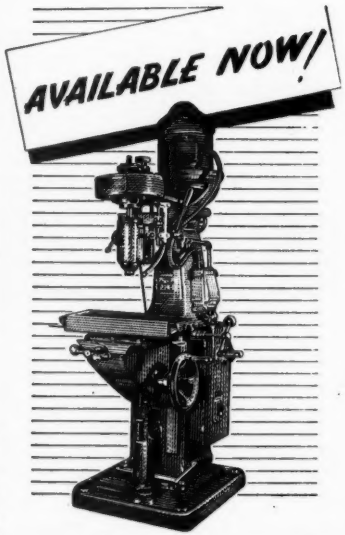
Electric MULTI-PURPOSE TOOL
"THE ENGINEER'S GOOD COMPANION"

This high-speed Tool Cuts, Grinds and Polishes. Has many Tool Room and Production uses.

Send for Leaflet X32.

A HAND MACHINE TOOL

RUNBAKEN - MANCHESTER - 1



machine tools

OF NUMEROUS TYPES

Government Surplus machine tools available NOW at attractive prices. YOUR opportunity to get better equipment and increase production

DISPOSAL CENTRES, ***where records of all machines available may be inspected, are open to the public for enquiries from 10 a.m. to 4 p.m. Monday to Friday inclusive :—***

BIRMINGHAM
C.M.L. Buildings, Great Charles Street.

BRISTOL
8/9 Elmdale Road, Bristol 8.

CARDIFF
Imperial Buildings, Mount Stuart Square.

GLASGOW
21 Glassford Street.

LEEDS
10 Bank Street, off Boar Lane.

LONDON
Room 0088, Ground Floor, Thames House North, Millbank, S.W.1.

MANCHESTER
Britannia House, Fountain Street.

ISSUED BY THE MINISTRY OF SUPPLY

"Agreed, then.. to give the Savings Groups all the help we can"

A successful Savings Group is an important asset. It helps new-comers to settle down, and it is a sure indication of a friendly spirit throughout the firm. Group Saving calls for a special effort now; and wise managements and responsible employees fully realise how important it is for people to go on saving the simple way—at work. A review of your own Staff Savings Group may reveal some way in which you can beat your previous best efforts.

New groups
If you have no Staff Savings Group, will you get one started right away? Every place of employment should have its own group.

Facilities
Experience shows that the fullest facilities induce the highest Savings. Ask your Local Savings Committee or Assistant Commissioner for details of the various schemes.

New members
If you have a Savings Group, will you do all you can to encourage the Staff to join?—every employee a group member should be the aim.

Savings clubs
These are the ideal way of saving for holidays, Christmas or other special occasions. Clubs are popular, easy to run and need not interfere with your Savings Group.

Information, equipment and publicity material are provided free of charge—apply to your Local Savings Committee or to the National Savings Committee, Sanctuary Buildings, Westminster, S.W 1.

It's easier to save in a

STAFF SAVINGS GROUP

Issued by the National Savings Committee

CLASSIFIED ADVERTISEMENTS

Rate 4d. per word, minimum 4/-
— Box Number Fee, 1/- —

Instructions should be addressed to "Plastics," Bowling Green Lane, London, E.C.1

AGENCIES

Established firm of wholesale distributors, excellent connection southern counties, modern warehouse, wish to contact manufacturers of all types of plastics, either as agents or cash buyers. D. H. Ridout and Son, Ltd., 12 Stedman Road, Southbourne, Bournemouth. zzz-409

Manufacturer of plastic braces wishes to contact buyers and agents. Cheap and good commission. Box 9271, care of "Plastics." 123-x6745

For Export and Home market. Manufacturer desires to contact exporting house prepared to take full production of household spider-type bracket as illustrated on page 326, June edition "Plastics." Inquiries invited only from well-established and serious firms, who can handle fair quanities. Box 9813, care of "Plastics." 123-34

Agencies Wanted

Agencies wanted for the sale of plastic and Perspex articles. Offices operating from all large cities. Send particulars for cash on delivery to N. Gerver, Plastic Sales Dept., 2-10 Mare Street, Hackney, London, E.8. Phone, Amherst 5805 (five lines) 130-25

AUCTIONEERS' ANNOUNCEMENTS

RICHARDS AND PARTNERS.
AUCTIONEERS, VALUERS AND SURVEYORS
of
INDUSTRIAL PROPERTY, PLANT AND MACHINERY.
GRANVILLE HOUSE, ARUNDEL STREET, LONDON, W.C.2.
Phone, Temple Bar 7471 (four lines).
zzz-408

BUSINESSES, PREMISES, OFFICES, etc.

Injection moulding factory for sale, modern machinery, spacious ground floor premises, 21 years' lease, London suburb, within easy reach of West End. Box 9727, care of "Plastics." 123-10

Businesses, Premises, Offices, etc., Wanted

Small plastic concern of injection and compression moulding, running concern with powder allocation and present orders only considered. West London area. Box 9730, care of "Plastics." 123-28

DESIGN AND DRAWING

Product designing. We can style and prepare working drawings of the article you have in mind for production. Quotations given upon request.
Design Industries, Kent House Station, Beckenham, Kent. Sydenham 5281. 124-701

Limited capacity available for designing of all types of machine tools, domestic and commercial equipment either mechanical or electrical, ideas developed or supplied as required, advertisers' illustrations prepared by first-class artist, all inquiries dealt with in strict confidence. Write for particulars to Box 9746, care of "Plastics." 123-15

Design and drawing capacity for plastics moulds (injection, compression, transfer) and component design development. Graystone Designs, 35 Winchester Road, Hampstead, N.W.3. Phone, Pri 7420. 123-x4829

Plastics designers. Components, moulds, tools and plant planned, designed and detailed. Alex S. Godfrey, 64a Clapham High Street, London, S.W.4. 125-2216

FINANCIAL AND PARTNERSHIP

Partner wanted in new injection moulding business, investment £4,000; modern automatic machines and splendid factory premises. Write Box 9614, care of "Plastics." 123-x7754

MACHINERY, TOOLS AND PLANT

Hydraulic Accumulator, unused, by Fielding and Platt, 5¼-in. ram by 8-ft. stroke, ballast tank, 11 ft. 6 ins. by 8 ft. 6 ins. diameter, guides and stays. Thompson and Son (Millwall), Ltd., Cuba Street, London, E.14. East 1824. zzz-435

Daniels 50/75-ton double daylight upstroke plastics press, fitted with Towler Electraulic auto pump, oil reservoir, and all guards, electric or steam heated, water cooled, immediate delivery, best offer over £600. Box 9725, care of "Plastics." 123-18

Comb Moulds.
Several hair comb moulds producing good-quality dressing, tail, side and pocket combs available; also safety razor moulds, suitable for use with 4-oz. EMB machine. Box 9763, care of "Plastics." 123-22

Machinery, Tools and Plant (contd.)

Injection moulding press for sale, together with Bradley and Turton pump; vertical type, suitable polythene or P.V.C.; up to 12-oz. shot. Box 9598, care of "Plastics." 123-x7700

Shipton injection moulding press for sale, suitable polythene; cylinder capacity 30 oz., complete with Towler electraulic pump. Box 9599, care of "Plastics." 123-x7700

Cockerham, Spencer and Nesbit, Ltd., Manor Buildings, Crawsham Hill, Pudsey, Nr. Leeds. Makers of dies for injection moulding. Your inquiries invited. Box 8680, care of "Plastics." 124-x4655

FOR SALE.

Stainless Steel ENCLOSED PRESSURE VESSELS, approximately 1 ft. 10 ins. diameter by 2 ft. 4 ins. deep, about ½ in. thick. Bolted top cover with manhole and glanded agitator entry with stainless steel agitator; mild steel outer jacket for 50 lb. per sq. in. steam pressure and crown wheel and pinion fitted to agitator shaft, drive from fast and loose pulleys; mounted in mild steel outer framework.
REED BROTHERS (ENGINEERING), LTD.,
BEVIS MARKS HOUSE,
LONDON, E.C.3.
Phone, Avenue 1677-8.
Grams, "Replant Ald London."
123-6

RADIO FREQUENCY HEATERS.
Resonant Line, 1 kW output.
100 M/cs. 4 kVA.
Heat 1 lb. material to 100 C. in 70 secs.
At £100 cheaper than any current model of its capacity—guaranteed three months, service given for 10 years.
Full particulars, etc., with data and photographs, from:—
ACME ELECTRICAL SERVICE AGENCY,
Electronia Works,
CHAMBER STREET, GRANTHAM.
Phone 962.
123-32

One Mitchell electrically heated drying cabinet, with indicating-type thermostat.
One 6 by 8 rotary cutter, with standard feed hopper and chute-type magnetic separator 18 ins. wide.
One electric pump, ½ h.p. 400/440v. Brook motor.
One polishing machine with dust extractor, 1 h.p. 230v. Brook motor, automatic starter.
18 polishing machines, mounted, some automatic, and some self-starters.
Two unmounted polishing heads, 1 h.p. 230v. and 440v.
One S.H.3 injection-moulding machine, hydraulically operated, 10 h.p. motor drive. Box 9728, care of "Plastics." 125-2196

Injection-moulding machine for sale, 5-oz. capacity, complete with air compressor and motor, virtually unused, immediate delivery. Box 9747, care of "Plastics." 123-29

1946 T.M.A. 6-oz. fully hydraulic injection-moulding machine. Offers invited. Inspection by appointment. Box 9748, care of "Plastics." 123-30

Machinery, Tools and Plant, Wanted

Krause or similar blocking and embossing press wanted urgently, only perfect condition. Please send details immediately to Box 9752, care of "Plastics." 124-2202

PRODUCTION CAPACITY AVAILABLE AND WANTED

Pulverizing and grading of raw materials, Dohm, Ltd., 167 Victoria Street London, S.W.1. zzz-369

Repetition in Ebonite, Erinoid, etc. Capstan lathe work. Mansell, Temple Street, Rugby. 125-8451

Wanted, plastic articles of every description for export and British Isles. Representatives active in all parts. Can place large orders for export. Write N. Gerver, Plastic Dept., 2-10 Mare Street, Hackney, London, E.8. 131-394

Work wanted, tool room available for all sorts of press tools. Press work, assembling, spraying and all sorts of engineering to your design. Universal Components, Ltd., 19 Sunderland Terrace, W.2. Bay 6776. 131-392

We are able to undertake certain short or long runs of highly specialized medical and technical plastic moulded products. Injection, compression or sheet fabrication. Use our services for the preparation of prototypes. All inquiries strictly confidential. Box 7678, care of "Plastics." zzz-422

Production Capacity Available and Wanted (contd.)

Mouldings. The I.D. Co. method of cast resin mouldings for small or large runs. Initial cost is much lower than for Bakelite mouldings. Have your product moulded by this new technique. Mouldings from 1 to 160 ozs. Inquiries to Industrial Development Corporation, 4 Whitchurch Road, Pangbourne, Berks. Phone, Pangbourne 39. 123-660

We have increased capacity for the manufacture of plastic moulds, and can offer a high standard of workmanship and good delivery.
Blundell Bros. (Luton), Ltd. Engineering Division, Chaul End Lane, Luton, Beds. Luton 3976 and 4294. 123-657

Well-established firm would welcome orders, both home and abroad, for new model, lady's compact in coloured Perspex and brushed gold. Box 8141, care of "Plastics." 123-x3076

Beautiful plastic bracelets, made with nickel-plated loops interwoven with plastic in attractive colours; selling at 5s. and upwards, £1 per dozen, post free. Sample, 2s. 6d. Reynolds, 16 Wensley Street, Blackburn, Lancs. zzz-434

Injection moulding capacity available on 3-oz. injection moulding machine for short and long runs. Box 9035, care of "Plastics." zzz-438

Injection Moulding Capacity Available. Prompt regular deliveries guaranteed. Also specialists in assembly and finishing work, hand-painting, etc. Deliveries London area by our own transport. Inquiries welcomed and attended to immediately. Box 9887, care of "Plastics." 123-x8423

Perspex. Wanted firm experienced in flattening curved material to carry out substantial quantity of this work for owners. Box 9861, care of "Plastics." 124-2225

3-oz. Injection Moulding Capacity available; own raw material supplied, if required. Box 9883, care of "Plastics." 123-x8422

Artistic hand-painting of small articles or parts undertaken en masse, faces, flowers, figures, etc., we can quote for any quantities. Write Box E.607, Willings, 362 Grays Inn Road, London, W.C.1. 123-5

Wanted, supplies of plastic teapot and coffee percolators handles, regular quantities urgently required by large consumers. Full details to Box 9731, care of "Plastics." 123-11

Injection moulding specialists have for moulding capacity up to 4 oz., consultants on all injection moulding problems. Please send inquiries to Box 9761, care of "Plastics." 123-19

London firm has capacity for compression mouldings, black and walnut phenol powder available. Box 9755, care of "Plastics." 123-27

Capacity available for compression and injection mouldings of small articles; large or small quantities. North-east England firm. Apply Box 9487, care of "Plastics." 123-x7480

Injection moulding capacity available up to ¾-oz. shot. Customers' own moulds and materials preferred, but all inquiries will receive careful attention. Box 9639, care of "Plastics." 123-x7640

Efficient injection moulders, qualified and experienced in divers trade work, invite additional contracts; 1-oz. to 8-oz. capacity, home trade or export. Moulding powders available; customers' moulds preferred. Own toolroom, assembling and finishing facilities. Box 9269, care of "Plastics." 123-x6713

Fabricators of Catalin and similar plastics, offer capacity, for slicing, drilling, polishing, assembly, etc. Inquiries to: Blacks Industries, Ltd., 13 Chalton Street, London, N.W.1. Phone, Euston 6254. 123-x8030

Mouldings in ebonite, rubber and plastics. Modern factory has production capacity available. Inquiries invited for contracts with or without customer's own moulds. Box G2562, W. H. Smith and Son, Ltd., Manchester, 3. 124-2194

Advertiser desires to contact enterprising manufacturing firm able to produce P.V.C. sheets in artistic and leather grains, also matt/matt and polished/matt size 48 ins. by 24 ins. and over in .020" ins. thickness and above, suitable virgin compound; also guaranteed clean scrap available at very low cost. Box 9860, care of "Plastics." 123-38

Heat sealing capacity available for P.V.C. Modo Products, Beaumont Chambers, Beaumont Crescent, W.14 123-39

Immediate capacity available for moulding, forming and fabricating sheet thermo-plastic and post-forming thermo-setting materials, large or small runs, product design, tool design and manufacture. Inquiries in the first instance to Box 9859, care of "Plastics." 123-42

Capacity for design-manufacture of press tools, moulds, jig, fixtures, repetition turning, springs and presswork. The Super Ease Tool Co., Highfield Works, Oakley Road, Redditch. 123-37

RAW MATERIAL AVAILABLE AND WANTED

P.V.C. sheeting, .007 in., .025 in., .040 in., 50 lb., 36-in. rolls. Large stocks, quick delivery. Box 9815, care of "Plastics." 123-46

CUPREX, LTD.,
Stockists of I.C.I. Perspex.
Offer specially:
1/16-in., ⅛-in. and ¼-in. coloured.
Write for stock list and particulars to:—
FINSBURY PAVEMENT HOUSE,
120 MOORGATE,
LONDON, E.C.2. zzz-446

For sale, P.V.C. reground scrap, black and coloured. Box 9817, care of "Plastics." 123-44

Polythene Moulding Powders supplied ex stock. We can match your colour samples. Box 9816, care of "Plastics." 123-45

Perspex. Several tons clear Perspex, ⅛ in. to ⅝ in. thick, in various curved uniform shapes. Also quantity of broken ditto in small and large pieces. Inquiries invited for minimum 2-cwt. lots. Box 9862, care of "Plastics." 124-2223

Perspex. Clear bulk buyer wanted for 5 to 10 tons of broken pieces. Submit offer. Can be seen in London. Box 9863, care of "Plastics." 124-2224

For sale, laminated plastic. 500 sheets 38 by 38, 76 by 38, 38 by 28, ⅜ in., ½ in., ¼ in., 7/16 in. Various grades, natural, 4s. 6d. per sq. ft. to clear. Box 9884, care of Plastics." 123-x8470

Quantity of surplus Bakelite sheet wanted, laminated or bakelized canvas, thickness 1-16 in., either in sheet or strip, minimum width 1¼ ins. S. G. Young, 154-6 Blackfriars Road, London, S.E.1. Phone, Waterloo 4369, 6277. 123-x7753

1,000 yds 1-in. multi-beaded trans. plastic; quick sale; cheap. Box 9270, care of "Plastics." 123-x6745

Crinothene waste purchased at good prices. Any colour and quantity. Box 9392, care of "Plastics." 123-x7066

Wanted, plastic sheeting in all thicknesses from 1-16-in. to 1-in. Can place large orders for home and export markets. Please submit samples and prices to N. Gerver, 2-10 Mare Street, Hackney, London, E.8. 125-393

For sale, P.V.C sheeting, 36 ins. wide, .015 to .018 thick, in black and other colours, at 6s. 0½d. per pound; delivery ex stock. Plastic Materials, Ltd., 3 Red Place, London, W.1. 123-x3420

For immediate disposal, 500 sheets of pink Thermo-Plastic, .030-in. thick. Size of sheets, 36 ins. by 28¼ ins., weight approximately 1½ lb., 15s. per sheet. Samples will be submitted upon request. Box 8906, care of "Plastics." 123-5561

Ebonite and bakelite always in stock. Phone, Archway 3654. A. E. Goodeve, Ltd., 188a Seven Sisters Road, London, N.7. zzz-445

Corrugated Perspex sheets required, 6-in. corrugations. Please state quantity available, size, condition and price to: S. G. Young, 145-6 Blackfriars Road, London, S.E.1. Phone, Waterloo 4369, 6277. 123-x8031

Perspex for Sale, new sheets, offcuts, large and small scrap, powders; clear and colours. Box 9024, care of "Plastics." 124-696

JOHN F. MANN, LTD.,
DIRECT IMPORTERS OF MOULDING POWDERS,
Offer
UREA FORMALDEHYDE.
PHENOL FORMALDEHYDE.
POLYSTYRENE, etc., etc.
Prompt and forward delivery.
143 CANNON STREET, LONDON, E.C.4.
Phone, Mansion House 1270.
123-692

Wanted, supplies of Alkathene scrap metal free, colours only. Reply to Handley Publicity, Ltd., 15 Gerrard Street, N.W.1. 123-4

We can offer surplus manufacturer's stock. P.V.C. pressed, embossed and callendered sheeting in a variety of colours. Send your inquiries to Rubber Trading Co. (Kent), Ltd., 12 Piazza Chambers, Covent Garden, W.C.2. Temple Bar 4038. 123-8

3 tons virgin C.A. moulding powder for sale, good colours, can be used in Home market. Box 9726, care of "Plastics." 123-9

Raw Material Available and Wanted (contd.)

Regular supplies of imported plastics available: Urea, polystyrene, cellulose acetate, luminiscent cellulose acetate, ethyl cellulose, phenolic, moulding compounds, phenolic resins and adhesives, extruded polystyrene rods, celluloid in sheets, rods and tubes, cellulose acetate in sheets, casein sheets and rods, P.V.C. extrusion compound. Please send inquiries to Box 9205, care of "Plastics." zzz-442

Bakelite sheets, 50, 1-16-in. thick, black P/HP perf., new, to clear stock at 3s. 3d. per lb. Box 9751, care of "Plastics." 124-2203

P.V.C. clean strippings from cables, etc., blue, brown, red, yellow and black, first-class material, large quantities available, 1s. 6d. lb. Box 9744, care of "Plastics." zzz-443

ALKATHENE SHEET,
Approximately 9 cwt. in sealed containers.
GRADE 20—35 PER CENT. P.I.B.,
4 MILS BY $35/8$ INS. WIDE.
Offers to:—
L. LIPTON,
PHŒNIX WORKS,
LAMPRELL STREET, BOW, E.3.
Advance 3345.

123-35

For sale, P.V.C. scrap. Offers invited. Box 8494, care of "Plastics." zzz-426

Cellulose acetate scrap urgently required; best prices paid. Write, Cuprex, Ltd., Finsbury Pavement House. 120 Moorgate, London, E.C.2. Phone, Metro. 9641-5. zzz-424

Perspex cut to requirements. Denny, 271 High Street, Acton, W.3. Acorn 5777. 125-2193

Perspex acrylic sheet. Stockists offer good range in clear and coloured. Stock lists available. J. H. Berry (Plastics), Portland Works, Annesley Woodhouse. East Kirkby 2151. 127-2195

CLEAR I.C.I. PERSPEX.
7/32nd in. thickness.
400 SHEETS 21 by 21.
50 SHEETS 33 by 21.
Box 9743, care of "Plastics."

123-14

For sale, Virgin cellulose acetate and polystyrene, American origin, in various shades for manufacturing goods for export only. Inquiries invited. Box 9741, care of "Plastics." 123-12

Cellulose acetate scrap for sale, ton lots. Box 9753, care of "Plastics." 124-2189

PERSPEX.
Official Stockists
OFFER CLEAR AND PASTEL SHADES IN STANDARD SHEETS OR CUT TO SPECIFIC REQUIREMENTS;
Also
MOULDINGS OF ALL TYPES IN PERSPEX.
SYNTHENA, LTD.,
AKED STREET, VICAR LANE, BRADFORD.

125-2191

D. H. Ridout and Son, Ltd., 12 Stedman Road, Southbourne, Bournemouth, offer for immediate delivery:—
5,000 ft. green 1¼-in. plastic belting, first quality, ribbed both sides, 3d. foot.
5,000 ft. tan ditto, 3d. foot.
15 cwt. new interleaved amber acetate sheets, 26 ins. by 9 ins. by 1-16 in., at 2s. 6d. sheet.
3 cwt. Alkathene powders, light red, lemon, light green and other light colours, 4s. lb. to clear.
28 cwt. Perspex scrap, 1-16-in. to ¼-in. good-sized pieces, 2s. to 3s. per lb., according to quantities and sizes required. Minimum, 14 lb.
300 new light chocolate brown plastic sheets, 8 ft. by 4 ft. by 1-16 in., 1s. 4½d. sq. ft. Cream-faced one side, 3d. sq. ft. extra. Can be supplied in thicker gauges.
11,000 pairs canvas industrial mittens, ex-Government stock. Quick-release wrist fasteners. Suitable heavy work, gardening, etc., 4s. 6d. dozen pairs. Discount for quantities.
60 new opaque tangerine acetate sheets, interleaved, 48 ins. by 21 ins. by 1-16 in., 36s. per sheet.
2 cwt. clear acetate, .007 in., 3s. 6d. lb.
20 tons artificial silk waste stuffing material, for upholstery, etc. Prices on application.
Artificial silk velvet pile, wool suede pile, in all colours, for spray-finishing. Prices according to type and quantities required. 123-24

Raw Material Available and Wanted (contd.)

Plastic boards, 1/16 in., specially treated, highest artistic finish, suitable for panelling, furniture, bath, splashbacks, etc.; plain colours or marble effect, and wood (oak, mahogany, walnut, etc.), sheets 8 by 4 or cut to requirements. Prompt deliveries. Larks Spraying Process, Monument Hill, Weybridge. 123-40

For sale constantly, cut-offs of ⅛ and 1/16-in. natural Holoplast, from 1s. per lb., according to size of pieces. Larks Spraying Process, Monument Hill, Weybridge. 123-39

"Perspex" Sheet, new, paper covered, several thousand square feet, surplus stocks, for disposal, standard opaque colours, 1-16 in. and ⅛ in. thick sheets 48 ins. by 36 ins., 36 ins. by 36 ins., 42 ins. by 30 ins., etc.; also large and small offcuts and scrap. Offers for part or whole to Box 9858, care of "Plastics." 123-41

Large quantities clean polythene, white, black and other colours, segregated. Box 9865, care of "Plastics." 123-43

Perspex sheets, coloured and clear, standard sizes or cut to your requirements, deliveries from stock, offcuts also available, write for stock list. Box 9762, care of "Plastics." 125-2200

Moulding powders. If you have any redundant stocks for disposal contact us and also give us your inquiries if you are in need of supplies of other powders. Box 9756, care of "Plastics." 125-2201

S. R. F. FREED, LTD.,
THE STOCKISTS OF SHEETS, RODS, TUBES, OFF-CUTS AND SCRAP.
OFFER OTHER LINES WHICH CAN BE USED IN COMBINATION WITH PLASTICS.
UTILIZING ANIMAL AND VEGETABLE PRODUCTS.
Such as tortoiseshell, horn, cleaned and prepared cattle bones for industrial purposes, vegetable ivory nuts, porcupine quills, goose and duck feathers, and barrels, etc.
S. R. F. FREED, LTD.,
27b HIGH STREET, SOUTH NORWOOD, S.E.25.
Phones, Livingstone 4042; Sanderstead 2056.

123-402

Metal powders and oxides. Quotations and samples on application. Dohm, Ltd., 167 Victoria Street, London, S.W.1. zzz-410

We are now able to supply an adhesive suitable for cementing the Perspex which we supply. Inquries to Cuprex, Ltd., Finsbury Pavement House, 120 Moorgate, London, E.C.2. zzz-429

For sale, 15 tons P.V.C. black compound (recovered); samples available. Write to Cuprex, Ltd., Finsbury Pavement House, 120 Moorgate, London, E.C.2. zzz-428

Celluloid. Veined white celluloid, 125 mm. thick, polished one side only, large quantities immediately for export. Samples and lowest quotations. Box 9040, care of "Plastics." 123-695

Quantity of New Perspex Sheets, clear, cream, green, black, in ⅛ and 3/16 thickness. Inquiry Box 9022, care of "Plastics." 123-697

Ground Perspex. Any mesh supplied for facing leather cloth, display purposes, etc. Write Box 9043, care of "Plastics." 123-698

P.V.C. scrap for sale in varied form, chips, hides, tubing, etc. Write, Box 9044, care of "Plastics." 123-699

Wanted, plastic waste and plastic piece goods. Send particulars, stating quantity and price. Box 6695, care of "Plastics." zzz-400

Scrap plastic material wanted, any quantity. Perspex, Lactoid, Catalin, Acetate, Bakelite, Presspahn. Write, Plastics Dept., J. E. Hoare, Byton Chambers, Amen Corner, Tooting, S.W.17. 123-404

Perspex off-cuts, clear and coloured, cut to required size, lactoid rods and all forms of scrap plastic material; immediate delivery. Write, Plastic Department, J. E. Hoare, Byton Chambers, Amen Corner, S.W.17. zzz-359

Scrap. Why not let a well-established firm quote you for cellulose acetate, polystyrene, P.V.C. cuttings and other thermoplastic off-cuts and scrap? Having best use for these materials, highest prices can be paid. Quotations on receipt of representative samples to M. H. Grist (Plastics), Ltd., 82-84 Brighton Road, Surbiton, Surrey. Phone, Elmbridge 4214. zzz-393

Black Acetate, 2 mm. sheets:—56½ by 25, highly polished, 2,000; 47 by 15 dull finish, 2,600. Box 9272, care of "Plastics." 123-x6752

For sale, Perspex scrap, clear and coloured, 1/16-in. and ¼-in., offers invited. Box 9740, care of "Plastics." 123-x8168

SITUATIONS VACANT

Shorthand Typists, Private Secretaries, Clerks, etc., If you are in urgent need of staff, contact Embassy Secretarial Employment Bureau, Excel House, Whitcomb Street, W.C.2. Whitehall 5924. We specialize in efficient personnel. 124-8069

Toolmakers required for moulding tool work, experience essential. First-class craftsmen need only apply; top rate of pay to the right men; five-day week. Send full details to Seaforth, Watchett Works, Oakhurst Road, Southend. 124-693

Foreman required to take charge of small expanding plant processing thermo-plastic raw materials; experience of grinding, mixing, drying, pigmenting and thermo-plastic sheet manipulation an advantage. Good prospects, permanent position. Write, giving details of experience and salary required, to Box 9034, care of "Plastics." 124-694

Working toolroom foreman required by small firm in Essex. Experience in production of moulding tool work essential; five-day week. It is essential that applicant has sound organizing experience and ability and is a keen disciplinarian. Well-paid position for the right man. Send fullest details of past experience to Box 9026, care of "Plastics." 124-700

Jig and tool Draughtsman required, experience in the design of moulding with the Plastics industry essential; 5-day week, pension fund, good prospects. Apply, Staff Officer, British Insulated Callender's Cables, Ltd., Erith Works, Belvedere, Kent. 123-1

Plastic Moulder wanted with sound experience of injection and Compression moulding for factory in North. State details of experience and salary required. House will be provided. Commence September. Write Box 6154, William's Advertisement Offices, Bradford. 123-x7816

General manager required for Australian plastics factory, with complete knowledge of moulding, embracing compression, injection, extrusion, toolroom work and die manufacture, etc. Applications entertained only from men with first-class qualifications and factory experience. Good salary and future prospects for the right individual. Applicants should write full particulars, stating experience, qualifications, age, and copies of references. Box 935, care of Judds, 47 Gresham Street, E.C.2. 123-2

Experienced foreman or factory manager for injection-moulding plant. Applicant must be capable of handling staff, and fully controlling production. Give full details in first instance of qualifications, personal history, salary expected, etc. Box 9757, care of "Plastics." 123-20

Experienced operator required by West London factory to operate modern Daniells moulding press. Should have practical experience of both transfer and injection-type moulds on similar types of press. Good wages and working conditions. Superannuation fund, five-day week. Write Box AC21166, Samson Clarks, 57-61 Mortimer Street, W.1. 123-17

Research chemist required for London company, knowledge of synthetic resins an advantage. Excellent progressive position for the right man. Write full details, in confidence, to Box 9745, care of "Plastics." 123-16

British Moulded Plastics, Ltd., Avenue Works, E.4, have vacancies for a works chemist and development chemist, who should be male British subjects under 35 years of age. A university degree or equivalent is an essential qualification, and some industrial experience desirable. Successful applicants, who must show keenness, will be given positions of responsibility with excellent opportunities after an initial period of training. Applications to Acting Chief Chemist, giving full particulars and salary required. 123-3

Graduate physicist required for the development unit of Halex, Ltd., for plastic research and development work in the factory and laboratory. The position offers excellent opportunities for a keen young man, under good working conditions. Reply by letter, giving particulars of technical qualifications, age, previous experience and salary required, to the Secretary, Halex, Ltd., Highams Park, E.4. 123-7

Foreman to take complete charge cast resin shop, experience phenol resin essential; new process offering excellent prospects right man. Box 9758, care of "Plastics." zzz-444

Junior Development Chemist required in our plant laboratory, for the investigation and control of plant materials, including stainless steels, plastics, cements, ferrous and non-ferrous alloys; knowledge of instrumental techniques and glass blowing an advantage; age 23-30 years, B.Sc., A.R.I.C. or A.Met., qualification required; salary envisaged up to £400 p.a. dependant on age and experience; candidates should preferably reside in the Midlands area. Applications in writing to, Personnel Dept., Boots Pure Drug Co., Ltd., Station Street, Nottingham. 123-47

Situations Vacant (contd.)

FIRM IN THE PLASTICS INDUSTRY
(Southern Counties)
HAVE THE FOLLOWING VACANCIES IN THEIR RESEARCH LABORATORY:—

Qualified CHEMIST for work on organic problems.

Qualified physical CHEMIST.

Qualified PHYSICIST for research in industrial Applied Physics.

Well-paid positions with good prospects for the right men. Applicants are invited to submit in strict confidence full personal particulars, including experience and salary expected, marking letter of application with position they are applying for. Box 9750, care of "Plastics." 124-2198

Plastics Chemist. Vacancy exists in Birmingham for qualified Plastics Chemist in Development and Research Department. Primary duty to investigate application of Plastics to products of old established Company. Apply stating age, qualifications, and salary required to, Box 9759, care of "Plastics." 125-2199

Representatives required to cover Northern England, Midlands, Scotland and Northern Ireland, for sale of plastic moulding powders. Salary and commission. Full particulars and qualifications to, Box 9760, care of "Plastics." 123-21

Top Expert wanted to master vast production of Artificial Teeth; excellent conditions and salary offered. State experience and details, Box 9729, care of "Plastics." 123-23

Works Manager required for Plastics Company; centre of London; must have technical knowledge of casting resins, packing and dispatching; excellent prospects; applicants must submit full particulars of past experience, age and qualifications; all information treated in strict confidence. Box 9754, care of "Plastics." 123-25

We have a vacancy for a man with long experience and thorough knowledge of the making of casein buttons, to act as production manager of our button department; letters, which will be treated as strictly confidential, to the Managing Director, Gansolite, Ltd., York. 123-26

Chief plastics chemist required for factory in Greater London area. Applicants must possess practical knowledge of the processing of thermoplastics, particularly P.V.C., cellulose acetate. Service with established users of these materials advantageous. Commencing salary £900 per annum. Furnish full details to Box 9827, care of "Plastics." 123-36

North-East Coast factory requires supervisor for phenolic varnish manufacturing plant. State age, experience, etc. Box 9749, care of "Plastics." 123-31

Wanted, energetic young man with technical knowledge and commercial experience, by old-established business, to develop applications of plastic in a specialized industry. Position should show possibilities to right man. Box 9814, care of "Plastics." 123-33

SITUATIONS WANTED

Moulding shop foreman seeks similar position, 19 years' practical experience on compression and injection, first-class references. Home or abroad. Box 9019, care of "Plastics." 124-x6024

Plastics consultant with wide experience offers his services. Accepts part-time or short-term employment for development work, training of employees, production control, patent and literature research. Box 9742, care of "Plastics." 123-13

Management and sales executive with many years' experience of manufacturing and selling raw materials, laminated and trade mouldings; first-class records with important companies; excellent connections, with up-to-date knowledge of technical developments at home and in the U.S.A. Free to consider new post September. Box 9843, care of "Plastics." 123-x8410

TIME RECORDERS

Factory time recorders. Service rental. Phone, Hop 2239. Time Recorder Supply and Maintenance Co., 157-159 Borough High Street, S.E.1. 125-8459

MISCELLANEOUS

Extend Your Trade.
Use a Trade Mark. Consult
Trade Mark Protection Society
12 Church Street, Liverpool. 130-9745

Huts. Nissen type, 36 ft. by 16 ft. and other sizes; also other industrial buildings suitable for workshops, canteens, site offices, clubs, etc. No licence required. Write, phone or call (open Saturday afternoons). J. Thorn and Sons, Ltd., Box 138, Brampton Road, Bexleyheath, Kent. Phone, Bexleyheath 305 zzz-430

Miscellaneous (contd.)

Blister hangers, 91 ft. span and 45 ft. long, and other sizes. Steel or asbestos roofing. Suitable for repair shops, factories, storage, etc. Details from J. Thorn and Sons, Ltd., Box 115a, Brampton Road, Bexleyheath, Kent. Phone, Bexleyheath 305. zzz-437

Photography by Behr will show your product at its best. Ask for illustrated list. 44 Temple Fortune Lane, London, N.W.11. Speedwell 4298 zzz-436

We supply within 24 hours Golderstat Photocopies, the inexpensive reproduction of documents, illustrations, photographs, etc. Golderstat, 54 Golders Gardens, London, N.W.11. Spe 5643. 126-659

W. Page and Sons,
34 Langside Crescent, Southgate, N.14. Phone, Palmers Green 5087.
The following lines always in stock:—
Wooden boxes, 18 by 12 by 9, at 2s. 8d. each, 21 by 12 by 9 at 2s. each. With lids.
12 by 12 by 12 Australian butter boxes at 1s. 4d. each.
Large tea chests at 5s. 9d. each. Small tea chests at 4s. 6d. each.
Export cases in ½-in. timber all round, 30 by 17 by 14, at 12s. 6d. each.
Cartons. Large, medium assorted cartons sold mixed in approximately the following sizes:—20 by 12 by 12, 19 by 13 by 15, 21 by 14 by 13, 23 by 13 by 10½, 13 by 10 by 21, etc., etc.
5,000 lots and over at 1s. 3d. each. Under 5,000 at 1s. 4d. each. 30,000 in stock.
Small mixed cartons. Sizes range from 17 by 12 by 6 to 8 by 5 by 5, approximately. To-day's cheapest carton at 6d. each.
Thousands of others in stock. We would welcome your inquiries, which shall receive our prompt and courteous attention.
All goods free delivered in the London area, f.o.r. elsewhere. zzz-421

Engraved name plates, scales, dials, etc., supplied. Tickets and Co., Box 2, Silver Street, Leicester. 129-9541

Acid containers. High-quality ebonite containers available from stock, 29 gallons capacity, dimensions 17¼ ins. by 13½ ins. by 39¾ ins. high, suitable for handling and storing liquid chemicals, price £3 10s. each. United Ebonite and Lorival, Ltd., Little Lever, near Bolton, Lancs. 125-2190

Monomarks. Permanent London address. Letters redirected, 5s. p.a. Write, Monomarks, BCM/MONO76, W.C.1. 128-2192

TOO LATE FOR CLASSIFICATION

RAW MATERIALS AVAILABLE AND WANTED

EXTRUDED P.V.C. STRIP TO CLEAR, FIRST QUALITY.

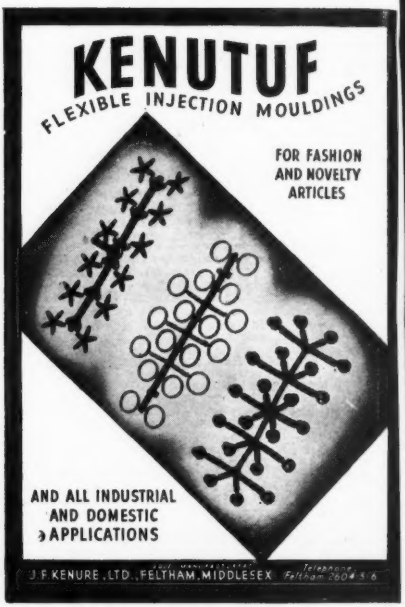
½-in. £8.10.0 PER 1,000 YARDS.
¾-in. £12.0.0 PER 1,000 YARDS.
1-in. £16.0.0 PER 1,000 YARDS

Colours: White, blue, green, pink, opaque and transparent.

DURAPLEX (PLASTICS), LTD.,
BURWOOD HOUSE, CAXTON STREET,
LONDON, S.W.1.
Whitehall 2980 and 2989 123-48

SITUATIONS VACANT

For employment in Northern Ireland an experienced injection moulder having also a knowledge of compression moulding of cellulose acetate and celluloid is required. Write giving details of experience, age and salary required to Box 9898, care of "Plastics." 123-49


KENUTUF
FLEXIBLE INJECTION MOULDINGS
FOR FASHION AND NOVELTY ARTICLES
AND ALL INDUSTRIAL AND DOMESTIC APPLICATIONS
J. F. KENURE, LTD., FELTHAM, MIDDLESEX. Telephone Feltham 2604-5-6

Octopus

ELECTRIC WIRING SYSTEM for FACTORIES, OFFICES AND HOUSES
APPLICABLE TO ANY SYSTEM OF BUILDING
Write for illustrated brochure to
PROVED AND PRODUCING PROPERTIES Ltd.
5, Cheapside, London, E.C.2, or
HARTLEY ELECTROMOTIVES, LTD.,
57, Victoria Street, London, S.W.1

BYSON
FOR BAKELITE
Acetate and other Synthetic Mouldings. Modern Plant and Facilities
APPLIANCE Co. LTD
WOOLFOLD, BURY, LANCS.
Telephone: Bury 1560-1 Telegrams: "Bysonite, Bury."

THERMOPLASTIC WELDING

Established Clothing Manufacturers wish to contact organisation or principals with the view to manufacture—would be interested to take over, extend or finance suitable proposition. Please state fullest particulars, which will be treated in strict confidence.

Box No. 9779, c/o "Plastics."

Printed in England and Published Monthly by the Proprietors, TEMPLE PRESS LTD., BOWLING GREEN LANE, LONDON, E.C.1

Rainbow Rival . . .

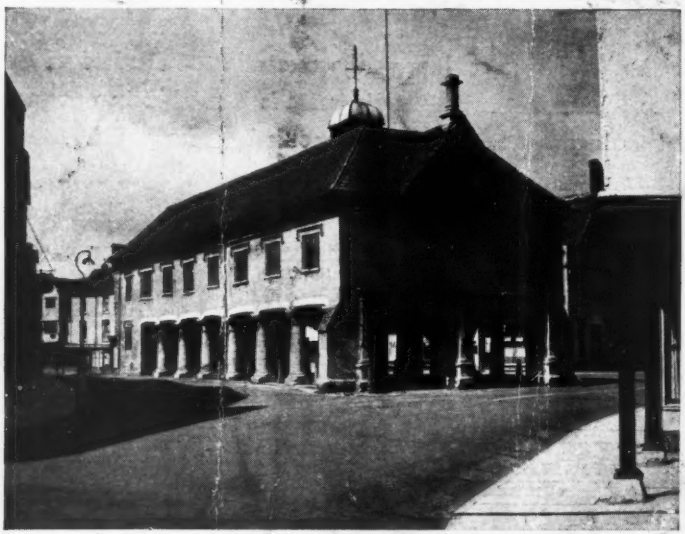
The CATALIN colour range exceeds 700 shades. This cast thermosetting phenolic resin is available in opaque, translucent, transparent and mottled colours. CATALIN is not surface dyed—the colour goes right through. CATALIN has a lively and vibrant quality all its own and opens to the Industrialist and Designer many completely new applications.

CATALIN is supplied in standard rods, sheets, tubes and special sections, or to any specification.

The Gem of Modern Industry

CATALIN LIMITED, WALTHAM ABBEY, ESSEX. *Telephone: Waltham Cross 3344*

AUGUST, 1947. Vol. XI. No. 123. Plastics TWO SHILLINGS



The Market House—

TETBURY, GLOUCESTERSHIRE

Square windowed and turreted, the Tetbury Market House dates from the days of Good Queen Bess, and forms an imposing frame through which to view the Cotswold stone frontages of Long Street.

Erinoid LIMITED

MANUFACTURERS OF MODERN PLASTIC MATERIALS

—in the Cotswold Country

ERINOID LTD., LIGHTPILL MILLS, STROUD, GLOUCESTERSHIRE

Telephone : Stroud 810 (5 lines)

Sales Offices, London : 208a Regent Street, W.1. Telephone : Regent 0418

Birmingham : 3 Colesbill Street, Birmingham 4. Telephone : Birmingham Central 1886

INGS